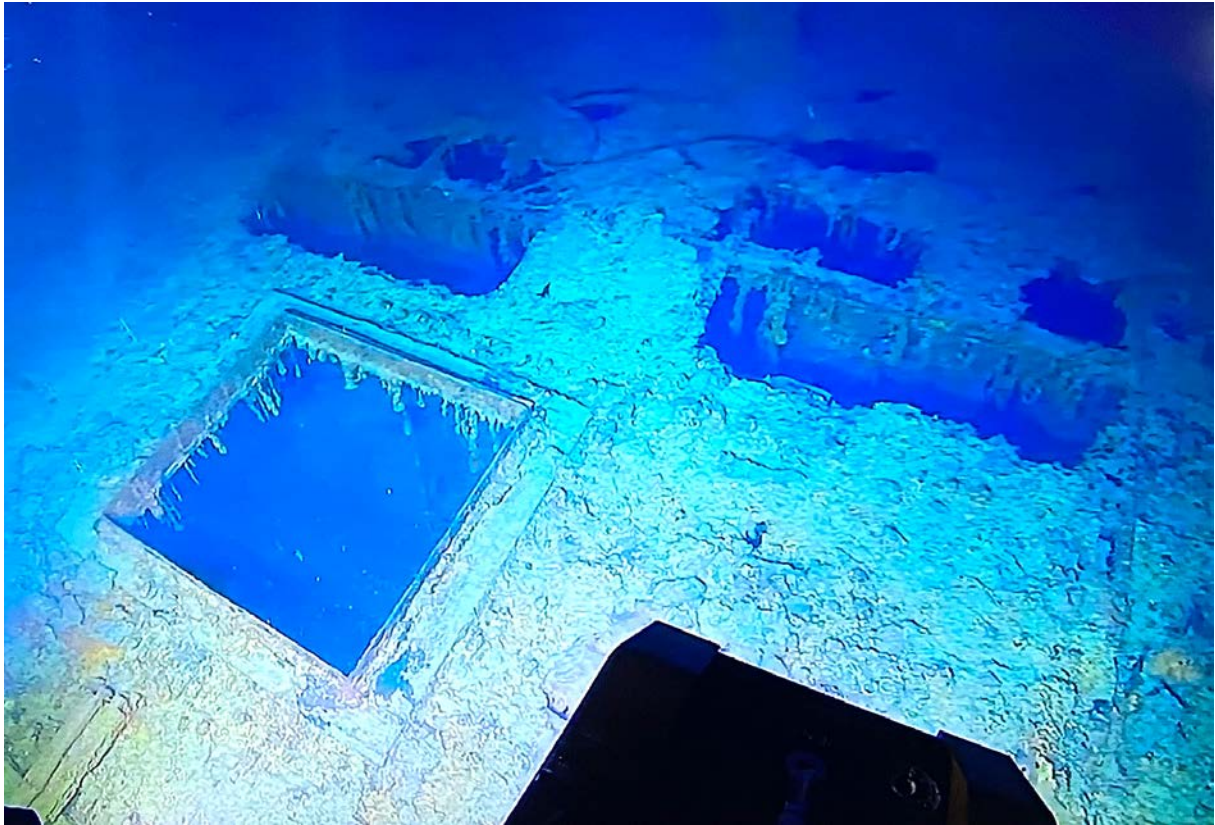


## EXHIBIT A

# **RMS *Titanic* Expedition 2020**

## **Research Design**



**RMS TITANIC, INC.**  
Peachtree Corners, Georgia

**24 March 2020  
FINAL DRAFT**

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## **RMS *Titanic* Expedition 2020 Research Design**

### **Executive Summary**

This research design was prepared by RMS Titanic, Inc. (“RMST”) to describe the planned survey and assessment of the wreck site of the Royal Mail Ship *Titanic* (“*Titanic*”) and the planned artifact recoveries. Geographical and historical contexts are presented, followed by descriptions of previous investigations in the historic shipwreck. The document then describes the planned research and poses research questions to be answered during the project. Also covered are a timetable, key personnel, conservation and curation, and budget. Additional supporting information is appended. The planned 2020 expedition to *Titanic* will be conducted by RMST, salvor in possession of the wreck. The 2020 expedition will determine the current state of the shipwreck, identify and assess factors that pose threats to site, and recover selected artifacts.

The planned 2020 expedition described herein represents the next phase of a long-term plan for investigating the site and recovering artifacts and hull components that can help tell the story of this famous ship. All assessment and recovery operations will involve a certified maritime archaeologist and a professional conservator. Extensive photographic and videographic documentation will take place in and around the bow, especially in the area of the Marconi Suite. High definition video will be recorded of all activities on the wreck site. Planned recoveries include select objects from the debris field and, if determined to be feasible, components of the Marconi wireless telegraph system. Conservation and curation are addressed, as is dissemination of project results. Artifacts will be recovered only when they meet criteria established by RMST and in cases where recovery will likely result in little or no damage to the wreck or the environment. This research design has been prepared in accordance with the recommendations contained in the National Oceanic and Atmospheric Administration (“NOAA”) “Guidelines for Research, Exploration and Salvage of R.M.S. *Titanic*,” 66 Fed. Reg. 18905-13 (Apr. 12, 2001). Although not required, this research design also conforms to the recommendations of the UNESCO Convention on the Protection of the Underwater Cultural Heritage.

# **RMS *Titanic* Expedition 2020**

## **Research Design**

### **I. INTRODUCTION**

This research design provides the framework for a survey and assessment of portions of the wreck site of the Royal Mail Ship *Titanic*, followed by selective recovery of artifacts from the debris field and, if established conditions are met, recovery of components of the Marconi wireless telegraph system. This document will inform and guide project personnel during planning and operational phases of the 2020 expedition to the *Titanic* to be conducted by RMST.

### **II. PROJECT BACKGROUND**

#### **Geographic Setting and Site Location**

The RMS *Titanic* sank off the Canadian coast on its inaugural voyage after striking an iceberg. The wreck site is approximately 370 nautical miles (“nm”), 685 kilometers (“km”) southeast of Newfoundland and Labrador in approximately 12,500 feet (3,810 meters) of water (Figure 1).

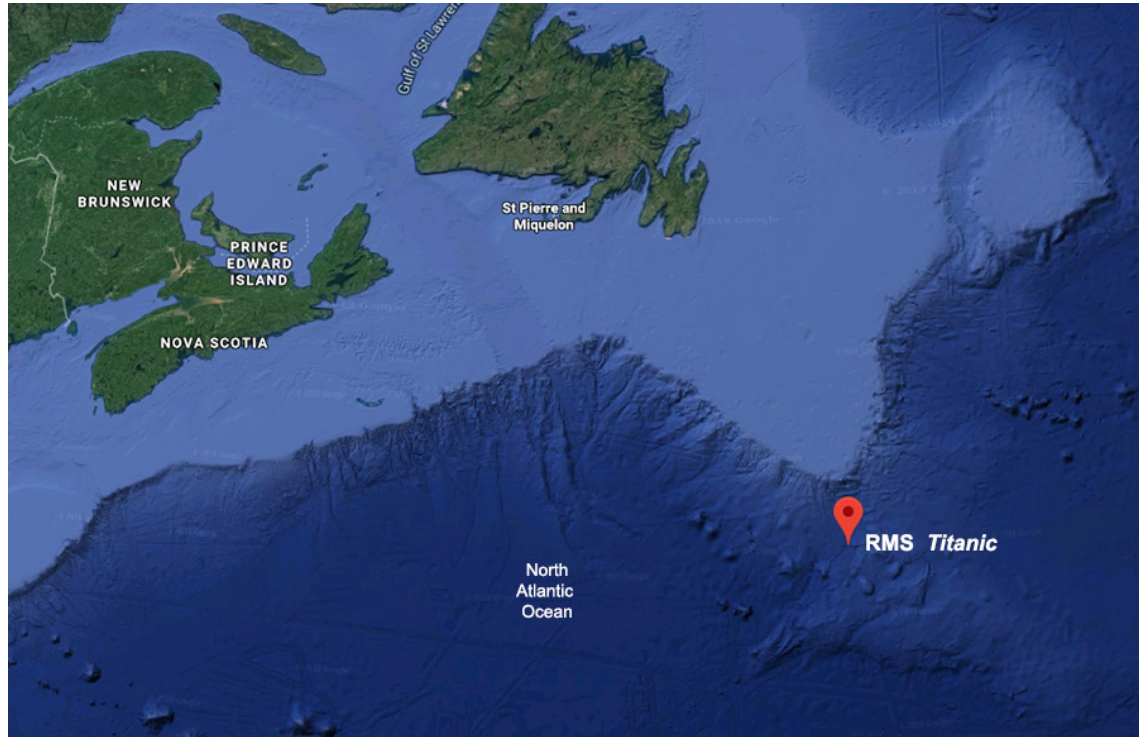


Figure 1. Map showing *Titanic*'s general location (Google Earth).



The site lies well off the edge of the Continental Shelf of Nova Scotia/Newfoundland. More specifically:

The wreck site lies at the end of Cameron Canyon...descending from the Newfoundland Ridge to an abyssal plain about 2.5 miles below the ocean surface. The canyon floor is covered by sediment debris and slumps transitioning into the Titanic Sediment Wave Field, a large muddy plain, characterized by dunes, sand ribbons and sheets, formed by strong underwater currents moving through the area. These currents are probably also the reason why the debris from the sinking ship is scattered over such a large area (Bressan 2019).

## **Historic Context**

### **One of the World's Largest Ships**

*Titanic* was a British luxury passenger liner, built and owned by the famous White Star Line. In the early part of the 20<sup>th</sup> century the transatlantic passenger trade was highly profitable and competitive, prompting the two major shipping lines, White Star and Cunard, to build ever newer and larger ships. White Star, in a move designed to maintain parity with Cunard, announced that they would construct three new vessels: *Olympic*, *Titanic*, and *Britannic*, all designed for maximum passenger comfort.

On March 31, 1909, the keel was laid for *Titanic* at the massive Harland and Wolff yard in Belfast. Safety was a major element in the design of all three ships. *Titanic* had 16 compartments fitted with doors that could be closed from the bridge to contain any water entering the hull through a breach. This system led some to claim that *Titanic* was unsinkable.

*Titanic* was launched on May 31, 1911, undergoing successful sea trials in early April, 1912. At the time, *Titanic* was the largest and most opulent ship in the world. The ship was 882.5 feet (269 meters) long and 92.5 feet (28.2 meters) wide, with a gross registered tonnage of more than 46,000 tons. Fully laden, the ship displaced more than 52,000 tons (*Encyclopædia Britannica*, <https://www.britannica.com/topic/Titanic> (accessed March 8, 2020)).

### **Disaster at Sea**

On April 10, 1912, *Titanic* set sail from Southampton, England to New York, New York, on a voyage that would end in tragedy (Figure 2). This was *Titanic*'s inaugural voyage and the first-class passenger list included many wealthy and well-known people, including executives of the White Star Line, which owned *Titanic*. Shortly before midnight on April 14, 1912, the "unsinkable ship" struck an iceberg approximately 370 nm southeast of Newfoundland, Canada, and sank in a little over two and a half hours. *Titanic* carried enough lifeboats to accommodate only half the people on board, and those it launched were never filled to capacity. Consequently, only 705 passengers and crew survived the sinking; more than 1,500 people lost their lives (Concannon 2015, <https://www.davidconcannon.com/titanic-legal-battles> (accessed March 7, 2020)).

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Even fewer would have survived had it not been for *Titanic*'s wireless operators who, despite a specific company regulation to the contrary, made field repairs to the Marconi wireless telegraph on the night before striking the iceberg so they restore the full 250 nm (463 km) range of the Marconi transmitter, thereby allowing them to send out distress calls far beyond the meager 70 nm (130 km) of the emergency transmitter. Without their courage and skill, the wireless might not have had sufficient range to reach the eventual rescue ship, RMS *Carpathia* (Parks Stephenson, RMST 2020).

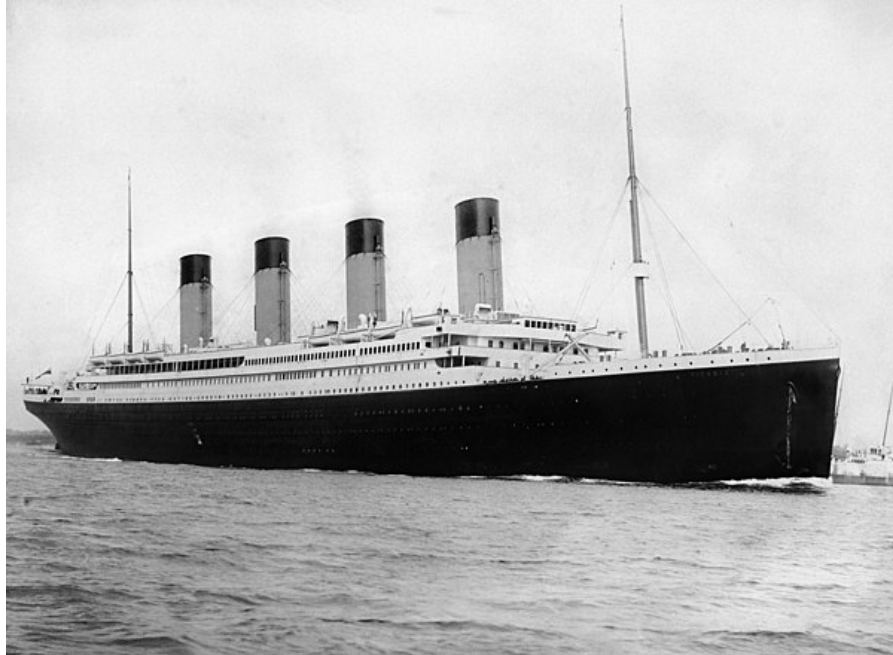


Figure 2. Photograph of RMS Titanic departing Southampton (Wikipedia)

## Previous Investigations

### Discovery and Initial Mapping

On September 1, 1985, a joint American-French expedition led by Dr. Robert Ballard of the Woods Hole Oceanographic Institution and Jen-Louis Michel of the Institute of France for the Research and Exploration of the Sea ("IFREMER") discovered *Titanic* using sonar and photographic equipment towed behind the U.S. Navy research vessel *Knorr*. The wreck was discovered lying in two sections, separated by a large debris field, at a depth of 12,500 feet. The expedition produced a photomosaic and survey of the wreck site, documenting for the first time the remains of the crow's nest where lookout Frederick Fleet shouted "Iceberg, Right Ahead!" as well as the boat deck, lifeboat davits and the remains of the bridge where Captain Edward J. Smith was last seen before the ship's sinking.

As news of *Titanic*'s discovery spread around the world, a deep rift quickly developed between those who desired to recover artifacts from *Titanic* and others who insisted it



should remain undisturbed as a monument to the victims of its tragic sinking (Concannon 2015).

### **The Lure of *Titanic***

Since its discovery by an international team in 1985, *Titanic* has lured scientists, archaeologists, salvors, adventurers, and tourists to venture two and a half miles into the depths of the North Atlantic for a glimpse of this historic wreck—arguably the most famous shipwreck in the world. The wreck site has been visited by at least 25 expeditions supported by cash and in-kind funding from an assortment of profit and non-profit corporations, small businesses, government agencies, independent scientists, and even individuals (See Table 1). Among the numerous “tourist” visits to *Titanic* was a couple who paid a large sum of money to be married during a submersible dive to the wreck.

This relatively high level of attention to a shipwreck located under 2.5 miles of seawater within an often inhospitable area of the world’s oceans is testimony to: (1) its widely perceived historical significance, (2) its attractiveness to marine scientists and archaeologists as a unique deep-water site, (3) its connections with deeply-rooted, emotive topics about humanity that are imbedded within the many stories about the tragedy, and (4) sustained public interest in exploration and study of the site, and (5) a seemingly insatiable public demand for new information about all things *Titanic*. This “market demand” is expressed in paid admissions to *Titanic* exhibitions, viewership of movies and documentaries, sales of *Titanic*-themed publications and other knowledge-based products, and auction prices of *Titanic* memorabilia (i.e. objects *not* recovered from the site) (RMST).

### **Legal Efforts to Acquire Control the Wreck (from Concannon 2015)**

Dr. Ballard returned to *Titanic* in 1986 to photograph the wreck using the deep diving submersible *Alvin* and the remotely operated vehicle *Jason Junior*. The expedition conducted ten dives and took more than 57,000 photographs of the wreck site, including many that captured the world’s imagination. Particularly arresting was the ghostly image of a chandelier hanging forlornly from the ceiling inside the wreck. On his final dive to *Titanic*, Ballard placed a bronze plaque on one of the ship’s bow capstans commemorating the efforts of those who discovered *Titanic* and requesting that “any who may come hereafter leave undisturbed this ship and her contents as a memorial to deep water exploration.”

Dr. Ballard never permanently recovered any artifacts from *Titanic*, nor did he assert a claim to the wreck in court. Instead, he worked to promote an international agreement to protect *Titanic* from commercial salvage and to obtain passage of the *R.M.S. Titanic* Maritime Memorial Act of 1986 (16 U.S.C. § 450rr et. seq.). The Act expresses the sense of Congress that “limited exploration activities concerning the *R.M.S. Titanic* should continue for the purpose of enhancing public knowledge of its scientific, cultural, and historical significance” (16 U.S.C. § 450rr-5). The Act also proscribes the assertion of jurisdiction by the United States over the *Titanic* wreck site because it is located in international waters (*Ibid.*).

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The French did not share Dr. Ballard's sentiment that *Titanic* should remain undisturbed. In August 1987, IFREMER and an American company, Titanic Ventures, L.P., salvaged the first artifacts from *Titanic*. Using the submersible *Nautilus*, the expedition conducted 32 dives and recovered 1,800 artifacts, including the crow's nest bell rung by lookout Frederick Fleet before the ship's collision with the iceberg, Captain Smith's aluminum megaphone and lapis lazuli china from the first-class dining room. The expedition also recovered a black leather bag containing \$62,000 in currency, 300 gold coins and several items of precious jewelry. To the members of the 1987 expedition, the recovery of artifacts symbolized their effort to share the tragedy of *Titanic*'s sinking with the world. To others, it symbolized a desecration of the grave of 1,500 souls. The expedition sailed into a storm of international criticism – the *London Daily Express* called its participants “Gallic Ghouls of the Deep” – but the landing of the artifacts in France was well-received and the live broadcast, “Return to the *Titanic*,” on October 28, 1987 set viewing records.

In June 1991, a joint Canadian-Russian-American expedition used the Russian research vessel *Akademik Mstislav Keldysh* and its advanced deep-water submersibles, *Mir I* and *Mir II*, to study *Titanic*'s marine environment and film the IMAX documentary “*Titanica*.” The expedition recovered steel samples from the debris field for metallurgical testing that subsequently revealed that the steel used to make *Titanic* was more brittle than that used today and a loss of its ductility in the cold North Atlantic waters most likely contributed to the damage that led to the ship's sinking. The expedition shot 40,000 feet of 70mm IMAX film, documented 28 species of animals and fish and collected hundreds of samples of fish, rock, bacteria, specialized coral and core samples from the deep ocean floor. Although the 1991 IMAX expedition did not recover any artifacts, it represented a threat to the salvors' ability to control access to the wreck.

In 1992, a would-be salvor, Marex Titanic, Inc. (“Marex”), filed a complaint in the U.S. District Court for the Eastern District of Virginia, Norfolk Division, seeking the exclusive right to salvage artifacts from *Titanic*.

On August 12, 1992, the court asserted jurisdiction over *Titanic*, issued a warrant to “arrest” the shipwreck and ordered the U.S. Marshal to take possession of any artifacts recovered from *Titanic* until the court made a determination of ownership (*Marex Titanic, Inc. v. The Wrecked and Abandoned Vessel*, 805 F. Supp. 375 (E.D. Va. 1992), *rev'd.*, 2 F.3d 544 (4<sup>th</sup> Cir. 1993)). Marex, however, had never performed any salvage operations at the *Titanic* site. As soon as Titanic Ventures learned of Marex's action, it intervened to assert a superior salvage claim and prohibit Marex from engaging in salvage operations (*Ibid.*). After a hearing to determine which party had exclusive salvage rights, the court sided with Titanic Ventures and entered an order vacating the August 12, 1992 order (*Ibid.* at 377). The court's order, however, was later reversed by the Fourth Circuit on technical grounds, which left the question of salvage rights unresolved.

On August 26, 1993, RMS Titanic, Inc., the successor in interest to Titanic Ventures, filed a complaint in Norfolk asking the court to declare it to be the sole and exclusive owner of any items salvaged from *Titanic* (*R.M.S. Titanic, Inc. v. The Wrecked and Abandoned Vessel*, 924 F. Supp. 714 (E.D. Va. 1996)). Relying on the presence of a wine decanter

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recovered from *Titanic* in the courtroom, U.S. District Judge J. Calvitt Clarke Jr. asserted *in rem* jurisdiction over *Titanic* and the wreck site (*R.M.S. Titanic, Inc. v. The Wrecked and Abandoned Vessel*, 9 F. Supp. 624 (E.D. Va. 1998)). The court ordered the U.S. Marshal to arrest *Titanic* and the artifacts already recovered pursuant to Supplemental Admiralty Rule C (2), and RMST was appointed substitute custodian of the wreck, wreck site and artifacts recovered, in lieu of the U.S. Marshal (*Ibid.*).

On August 13, 1996, Judge Clarke unilaterally entered an amended order expanding RMST's rights as salvor in possession to include the exclusive right to control access to *Titanic* "for any purpose," and to control photography of the wreck and wreck site. The court explained that it made this unprecedented expansion of traditional salvage rights because RMST was unable to recoup its salvage expenses through the sale of artifacts and, therefore, it was entitled to the exclusive right to market images of *Titanic* as a means of making a profit (Order dated August 13, 1996, at 3-4).

Subsequent efforts by other parties to gain access to the wreck precipitated additional court proceedings. In 1998, two competing expeditions to *Titanic* were planned for the month of August: (1) RMST planned to return to the wreck to recover a large section of the hull dubbed "the Big Piece" and to produce the first live television broadcast from the wreck itself; and (2) the P.P. Shirshov Institute of Oceanology and a British tour company, Deep Ocean Expeditions ("DOE"), proposed to charge an international group of passengers \$32,500 each to dive to the wreck, photograph and videotape *Titanic*, and participate in scientific research on an expedition promoted as "Operation Titanic."

DOE and the Shirshov Institute pledged not to recover any artifacts or disturb *Titanic*. Nevertheless, RMST filed a motion for a preliminary injunction in its *in rem* action against the *Titanic*, requesting that any person or entity mentioned in Operation Titanic's promotional material be prohibited from visiting or photographing the *Titanic*. After RMST filed its motion, Christopher Haver, a passenger who had paid a deposit to participate in Operation Titanic, filed a separate action seeking a declaratory judgment that viewing *Titanic* would not injure RMST. The court subsequently consolidated Haver's declaratory judgment action into RMST's *in rem* proceeding.

On June 23, 1998, Judge Clarke issued a preliminary injunction prohibiting all of the individuals and entities identified in RMST's motion from taking personal photographs of *Titanic* or visiting *Titanic* for any reason. The injunction prohibited the expedition participants and "all the world" from entering a 168-square-mile area of the high seas encompassing *Titanic* for an indefinite period of time. Judge Clarke reaffirmed that his decision to award RMST the exclusive right to control access to and photography of *Titanic* was based on his finding that RMST located *Titanic* and was entitled to expanded salvage rights because it had agreed not to sell artifacts.

Haver appealed the district court's order granting a preliminary injunction. On March 24, 1999, the Fourth U.S. Circuit Court of Appeals issued a decision affirming the district court's order in part, reversing in part and remanding with instructions to the district court to modify its order (*R.M.S. Titanic, Inc. v. Haver*, 171 F.3d 943 (4<sup>th</sup> Cir.), *cert. denied*, 528

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U.S. 825 (1999)). The Fourth Circuit rejected RMST's argument that an injunction is valid against a non-party who merely received a copy of a motion for a preliminary injunction in the mail, as opposed to an actual party who is named in a complaint, served with process and enjoined after an opportunity to appear and be heard. Therefore, the appellate court reversed the injunction because the district court lacked personal jurisdiction over the participants in Operation Titanic.

The court also rejected RMST's argument that it deserved the exclusive right to control access to and photography of *Titanic* as a "bonus" for agreeing not to sell artifacts. The court found that no precedent existed to support such a merger of intellectual property rights and traditional salvage rights. Indeed, the court found that such a merger was contrary to the purpose of salvage law, which is to recover ships lost at sea, because it would encourage salvors to leave ships in place and collect revenue by licensing access and photographic rights.

On the other hand, the court affirmed RMST's right to recover artifacts without direct interference from others while it is on site. The court also decided that a U.S. court can properly assert jurisdiction over a shipwreck located in international waters, finding that the precedent for such an assertion exists in the 300-year history of international maritime law. The court specifically rejected Haver's argument that the *R.M.S. Titanic* Memorial Act strips the federal court of jurisdiction over the wreck site.

On October 4, 1999, the United States Supreme Court denied RMST's writ of certiorari in the *Haver* case and the Fourth Circuit's decision was upheld. This effectively ended the litigation over access to the wreck site and set a precedent allowing public access to historic shipwrecks for exploration and photography.

The outcome of the *Haver* case also increased the difficulty RMST had in policing the wreck site in its role as salvor in possession. At least ten expeditions have visited the wreck site to film and conduct tourist dives since the conclusion of the *Haver* case. Although these expeditions did not interfere with RMST's salvage rights, an illegal salvage expedition visited the wreck site in 2002; an expedition with the capability to conduct salvage visited the wreck site in 2008 or 2009, but did not recover any artifacts; an expedition conducted by NOAA in 2004 removed scientific test stands placed by RMST on the bow of the ship and deposited them in mud; and a private expedition "authorized" by NOAA in 2019 struck the bow of the ship causing damage, which NOAA did not report to the court until nearly seven months later. Accordingly, legal proceedings to continue oversight and protection of the *Titanic* wreck site are likely to continue.

Research Design: RMS Titanic Expedition 2020 – 24 MAR 2020**Table 1. Major Expeditions to the RMS *Titanic* Shipwreck Site<sup>1</sup>**

Lead Organization(s)	Year(s)
Woods Hole Oceanographic Institution and IFREMER	1985
Woods Hole Oceanographic Institution	1986
Titanic Ventures LP and IFREMER	1987
IMAX Corporation	1991
RMST and IFREMER	1993, 1994
James Cameron and Associates	1995
RMST and IFREMER, DOE	1996, 1998
DOE	1999
RMST and DOE	2000
James Cameron and Associates	2001
Illegal Salvage Expedition	2002
NOAA and Cameron	2003
RMST	2004
NOAA, IFE and URI (Ballard)	2004
Cameron, DOE, Harris and Concannon	2005
Salvage Expedition in route to another location	2008 or 2009
NOAA, RMST	2010
EYOS, Caladan and Atlantic Productions	2019

Total Major Expeditions: 25

*1. Source: RMS Titanic, Inc.*

### **Reorganization of RMST**

One month after the 1999 action by the United States Supreme Court, a majority of the RMST's shareholders voted out the company's management. The company's fortunes dwindled, eventually leading it to file for Chapter 11 bankruptcy in 2016. This proceeding led to the sale of RMST's assets in an auction supervised by the Bankruptcy Court in 2018, which was subject to final approval of the Admiralty Court.

On December 21, 2018, the court authorized the sale of 100 percent of RMST's stock, its assets and its salvor in possession status to Premier Acquisition Holdings, LLC ("PAHL"), which eventually became Experiential Media Group, LLC ("E/M Group") (ECF No. 540, *R.M.S. Titanic, Inc. v. The Wrecked and Abandoned Vessel*, Civil Action No. 2:93cv902).

### **RMST Today**

#### **Experiential Media Group, LLC**

E/M Group, located in Atlanta, GA, is a world leader in the development and display of exhibitions that educate, entertain and inspire audiences of all ages. The Company's exhibitions captivate audiences through compelling stories, authentic artifacts, amazing specimens and animatronic creatures. Exhibitions are presented in museums, exhibition



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centers and other entertainment venues. Additional information about E/M Group is available at [www.emgroup.com](http://www.emgroup.com).

**RMS Titanic, Inc.**

RMS Titanic, Inc., an affiliate of E/M Group, serves as the exclusive steward of *Titanic*. The Company is dedicated to preserving the legacy of the ship, wreck site and all her passengers and crew through educational, historical, scientific and conservation-based programs. Since 1987, RMST has conducted numerous expeditions to the wreck of *Titanic* to conduct scientific research and exclusively recover and conserve more than 5,500 artifacts. Utilizing these recovered objects in concert with scientific data and historical research, RMST brings to the general public the celebrated and moving experience: *Titanic: The Artifact Exhibition*.

**Additional Legal and Ethical Considerations**

*Titanic* lies in international waters, not subject to the laws of any country. For that reason, the international law of salvage prevails. RMST has been appointed by the United States District Court for the Eastern District of Virginia as salvor-in-possession of the wreck of the *Titanic*. This status has been reaffirmed on numerous occasions, with the court's *in rem* jurisdiction affirmed by the Fourth U.S. Circuit Court of Appeals and United States Supreme Court. The court has ruled that stewardship of *Titanic*'s remains falls under the jurisdiction of the court, under Admiralty law, and has been disinclined to entertain arguments to the contrary. The United States, acting at the District Court's invitation as a "friend of the court," has asked the court to take into account two legal documents in evaluating salvage activities at the site: The UNESCO Convention on the Protection of the Underwater Cultural Heritage and the R.M.S. Titanic Memorial Act of 1986.

**The UNESCO Convention on the Protection of the Underwater Cultural Heritage** was adopted by the United Nations Educational, Scientific and Cultural Organization ("UNESCO") in 2001, and entered into force in 2009 upon ratification by the required 20 countries. The Convention sets out basic principles for the protection of underwater cultural heritage (shipwrecks, former terrestrial sites, and other evidence of past human activity), and provides practical rules for the treatment and research of underwater cultural heritage (UNESCO 2001). Although the Convention has been officially ratified by such countries as The Islamic Republic of Iran, Niue and Slovakia, neither the United States, Canada nor Great Britain, have ratified the Convention. (UNESCO 2020, <http://www.unesco.org/eri/la/convention.asp?KO=13520&language=E&order=alpha>, (accessed March 10, 2020)). Therefore, the Convention has no force of law in the U.S. However, many historic preservation organizations have informally adopted the restrictive principals and Annex rules of the Convention, and they look to it for guidance.

**The R.M.S. Titanic Maritime Memorial Act of 1986** (NOAA n.d.) was adopted as a means of expressing the desire for the wreck of *Titanic* to be treated with respect and dignity, recognizing its historical and archaeological significance and its status as a memorial for the more than 1500 men, women and children who perished the night *Titanic* sank. After public hearings and full compliance with the Administrative Procedures Act, 5 U.S.C. § 551, *et seq.*, NOAA published Guidelines for access to the wreck in 2001 (NOAA, Fed. Reg. Vol. 66, No. 71 (Apr. 12, 2001)). The NOAA Guidelines refer to the



Annex of the UNESCO Convention, but they carefully point out that the Guidelines “are separate and apart from the UNESCO treaty” (*Ibid.*). NOAA further stressed that “the guidelines are advisory only and are not legally enforceable;” therefore, they did not infringe on the U.S. District Court’s exclusive jurisdiction in admiralty in accordance with Article III of the U.S. Constitution (*Ibid.*).

As with the UNESCO Convention, the Titanic Memorial Act does not restrict RMST’s access to and activities concerning the *Titanic* wreck site. However, in November 2019 NOAA announced that the acceptance process for an international agreement severely restricting activities at the *Titanic* wreck site had been completed, and that the international agreement was officially in force. RMST has previously challenged the constitutionality of the international agreement and any efforts the U.S. Government may make to infringe upon its exclusive rights as salvor-in-possession. While the court has not yet ruled upon the legality of the international agreement, it has consistently expressed its view that the agreement and NOAA’s recent efforts to usurp the court’s jurisdiction are unconstitutional. Accordingly, RMST believes that the international agreement has no application to its activities.

### **III. CHARACTERIZATION OF THE WRECK SITE**

#### **General Description of the Wreck Site**

*Titanic*’s remains lie in approximately 12,500 feet (3.8 km) of water, with the hull broken into two large sections surrounded by an extensive debris field that includes hull components and fittings, equipment, supplies and personal possessions from within the ship. As seen in Figure 3, the bow section, about 470 feet (140 m) long, faces approximately north-northeast and is relatively recognizable despite striking the seafloor at an estimated 20 knots (23 mph or 37 km/h), burying itself approximately 60 feet (18 m) into the muddy bottom. The impact caused the hull to deform in two places and the funnels, wheelhouse and other features are missing.

The stern section, approximately 350 feet (110 m) long, lies about 1960 ft (600 m) to the southwest of the bow, with the rudder and propellers facing roughly northeast—almost 180 degrees out of alignment with the bow. The stern is in a much more deteriorated condition than the bow, with all of the decks collapsed on one another and the poop deck twisted and collapsed. As with the bow, the stern is partially buried, obscuring most of the rudder and the central propeller.

The wreck site encompasses a very large debris field, covering approximately five square miles (8 km<sup>2</sup>), which mapping has shown to consist of two distinct large fields and several smaller ones. Several mapping expeditions, notably the 2010 site characterization expedition, have helped researchers develop a sequence of the sinking event.

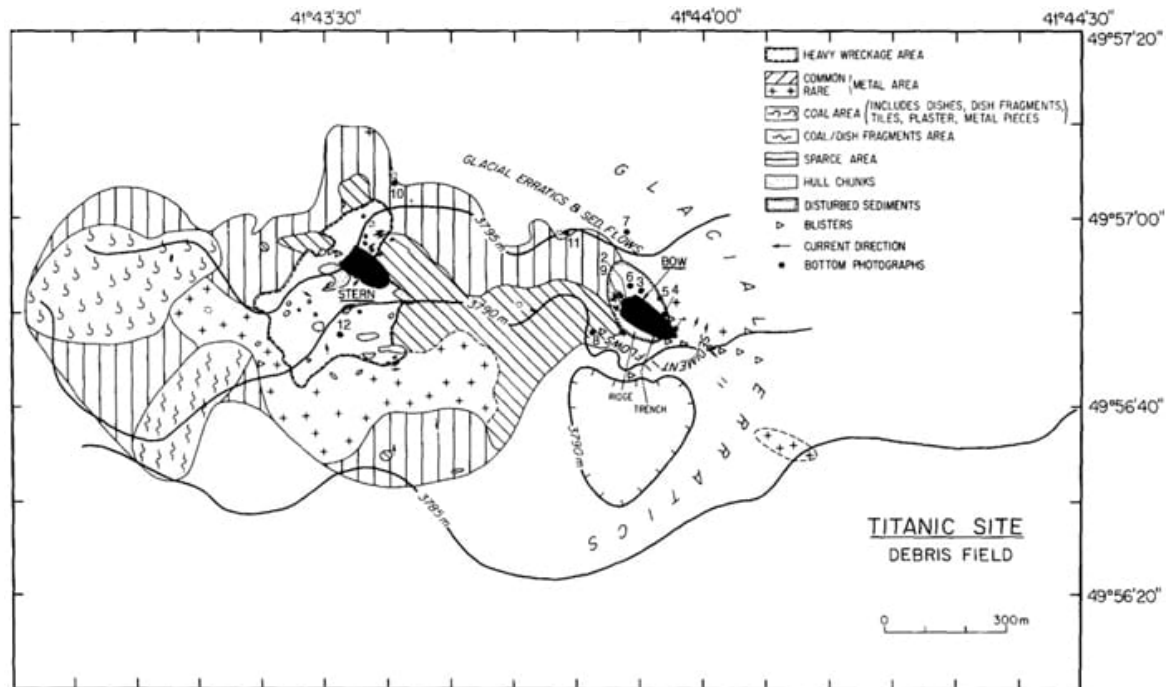
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Figure 3. *Titanic* wreck site (Woods Hole Oceanographic Institution)

### Current Condition and Evidence of Deterioration of the Wreck

#### Difficulties in Describing the Wreck and Predicting Deterioration

Given the vastness of the site and debris field and the difficulty of measuring the complex physical, chemical, and biological forces acting on the wreck and contents, it has been impossible to fully and completely describe the site, much less develop accurate predictions for its eventual disintegration. However, recent expeditions have resulted in accurate, geo-referenced maps of the entire site, along with extensive high-resolution imagery and video of all exterior and limited interior areas. Additionally, numerous researchers have been able to inspect the wreck in person by visiting the site in manned submersibles. The only point of complete agreement is that eventually *Titanic*'s hull and contents will disintegrate into an unrecognizable field of iron residue and miscellaneous debris, starting with the thinnest metal components at the top and working down to the superstructure of the hull.

These uncertainties—and differences of opinion among researchers—make it difficult for RMST to develop a strategic plan for how best to manage the wreck site. The concepts “good stewardship” and “*in situ* preservation” are difficult to apply when no predictive models exist to inform decisions on whether intervention in the form of cultural material recoveries or hull stabilization is warranted—or even feasible.

RMST is committed to obtaining guidance from the NOAA Guidelines to the fullest extent practicable, while at the same time fulfilling its plans to recover additional artifacts for conservation, curation and museum exhibition. These considerations have been addressed in the Expedition Plan presented below.

**Predictions of Future Deterioration of the Hull and Contents**

To establish priorities and justifications for the recovery of objects from the wreck site, RMST has made use of the best available scientific and engineering data from expeditions and subsequent analyses, conclusions, and recommendations. Unfortunately, those data vary across a wide spectrum, leaving it up to RMST's team to sift through the information and make its own determinations. The following reports and comments were taken into account in developing the present expedition plan.

**What forces are acting to destroy *Titanic*?**

A general misconception persists that shipwrecks in deep water are immune to corrosion (rusting) because the water contains insufficient dissolved oxygen for corrosion to take place. However, there is almost universal agreement among scientists that galvanic corrosion is the main agent acting to degrade *Titanic*'s hull. McCarty and Foecke (2008:188) state, "The main causes degrading the wreck today are corrosion and gravity." They add, "Even at *Titanic*'s depth the water still contains about 40 percent of the dissolved oxygen of that at the surface, more than enough to facilitate corrosion" (2008:191). A new book states similarly, "Hundreds of reasons have been proposed [for why *Titanic* collapsed], but the main reason seems to be bimetallic corrosion, also known as galvanic corrosion" (Rajendran and Singh 2019).

Numerous researchers also attribute a portion of *Titanic*'s degradation to microbial action, including:

- DNA analysis of rusticles (the icicle-like masses hanging from *Titanic*'s hull) from the 1991 *Titanic* expedition by Canadian and Spanish researchers showed that the rusticles were formed by a combination of 27 different strains of bacteria, including a previously unknown variety, quickly named *Halomonas titanicae* (Dnews 2013).
- Rajendran and Singh (2019:xiii) report, "The latest research ... reveals that the ship is ... reacting with bacteria and chloride ions, the corrosion culprit." They then remark, "*Titanic* has become food for the rust-eating bacterium *Halomonas titanicae*" (Ibid.:xiii-xiv).
- Tim Foecke stated in 2012, "We have been studying the steel recovered from the wreck extensively. The bacterial colonies, called 'rusticles', are changing the environment on the hull...." (Murray 2012).
- One of the 2019 expedition scientists, Clare Fitzsimmons of Newcastle University, studied rusticle samples and concluded, "There are microbes on the shipwreck that are eating away the iron of the wreck itself, creating 'rusticle' structures, which is a much weaker form of the metal...." (Daley 2019).
- Daley adds, "Mollusks, meanwhile, are eating away most of the wood left in the wreck (Ibid.)."

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- McCarty and Foecke determined, "...the presence of biological organisms becomes one of the huge factors that determines how fast a piece of metal will rust" (2008:196-7).
- In 2014, a team of scientists from the U.S. Bureau of Ocean Energy Management (BOEM) conducted perhaps the most in-depth study to date into microbial life on shipwrecks. Strangely, although the bacteria were essentially feeding on the ship, they actually served to protect them from corrosion. "In essence, what happens is that any vessel that sinks, be it a wooden 19th-century ship or a steel-hulled ship from World War Two, once it hits the floor it becomes available to microbes that rush to cover every surface," says marine archaeologist Melanie Damour at BOEM in New Orleans, Louisiana, one of the expedition's lead scientists. "At first the ship will begin to corrode as it is in contact with seawater, but as microbes begin to colonize the wreck they begin to form a biofilm, which forms a protective layer between the ship and the seawater" (Fox-Skelley 2018). This conclusion may not take into account the fact that the biofilm may protect against galvanic corrosion, but not against the action of the microbes themselves.
- In spite of significant agreement among researchers that microbes are a factor in *Titanic*'s deterioration, there is far less agreement as to the actual mechanism by which microbes are alleged to be "eating" *Titanic*'s hull.
- On February 20, 2020, P.H. Nargeolet, a marine engineer who has made approximately 30 dives to the *Titanic*, described the deterioration in the gymnasium, an area he had been observing for years. "...at 1987, the roof on the gymnasium was there. In '93 the roof collapsed on the inside...in 1998 I saw, for example, ... the bicycle...I can see very well through one of the window, ... but, unfortunately, in 2019, the deck of the ship close to this gymnasium, there was a hole growing and growing, and it was so big that the side of the gymnasium was starting to collapse, ... and last year everything collapsed inside, you know. "The deck was collapsed to each other...and even the high[t] between the deck[s], which is normally more than 10 feet, is now about five to six feet. The next step will be the Marconi room" (Tr. 2/20/20 (DE No. 599) at p. 59, line 15 to p. 62, line 7). He continued, "
- About the Marconi room, Mr. Nargeolet stated, "... the roof of the [adjacent] elevator [room is] already gone now.... I mean, the next big deterioration will be the Marconi room, you know" (*Ibid.*, 61.13-18). He added, "...very soon it will disappear, and it will go down, and it would be probably impossible to recover later" (*Ibid.*, 63.3-5).
- David Gallo also provided testimony on February 20, 2020, stating that when he examined photos of the rooftop above the Marconi room, "I wasn't expecting that, how perforated it is.... There are places where you can stick your finger through that rooftop" (*Ibid.*, 110.15-21).

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It is beyond the scope of this document to conjecture as to the mechanisms or extent of damage, or to the contribution of microbes relative to the more conventional galvanic corrosion. One conclusion is clear: *Titanic* is in an active state of deterioration, a condition that is predicted to continue and possibly accelerate. That leads to the big unanswered question on everyone's mind: "When will *Titanic*'s hull collapse?"

**Predictions relating to the collapse of *Titanic*'s hull**

There is no reliable answer to this question. In fact, most researchers have offered only very general predictions:

- In 2001, NOAA stated: "Based on the available information on the rate of deterioration, NOAA understands that the wreckage of the RMS *Titanic* is in a state of decay and expects that the hull and structure of the ship may collapse to the ocean floor within the next 50 years, perhaps sooner" (NOAA, 2001).
- McCarty and Foecke (2008:200) framed the question this way: "Each collapse or structural change depends on many factors: the local corrosion rates, the amount of damage the area has in the first place [as a result of damage during the sinking process], or the possibility that something else has fallen onto the structure... among other things."
- In 2012, Foecke commented, "The excitement comes because the wreck is in a deterioration midlife crisis. Things are starting to collapse, and in a couple of decades it will have folded in upon itself and will stabilize again, and in a century or so will reach its final state, an iron ore deposit" (Murray 2012).
- Rubinstein commented in 2018, "Because [bacteria] eat about 180kg (400lbs) [of iron] a day, scientists have given the ship a waning life expectancy."
- Lori Johnston, a biological researcher who has made six trips to the *Titanic* to study rusticles, has concluded, "If it's going faster, which we hypothesize, it's going to be less and less of a timeframe" (Rubinstein 2018).
- After reviewing a series of expert opinions, Ed Coghlan, chairman of the Irish Titanic Historical Society, said: "This research backs up what divers who have been down to the wreck have seen; that the ship is falling apart" (Smith 2011).
- Perhaps most pessimistic of all, in 2011 researcher Henrietta Mann predicted, "I think *Titanic* has maybe 15 or 20 years left. I don't think it will have too much longer than that."
- National Park Service archaeologist David Conlin reached a different conclusion, stating, "The wreck has been degrading gradually over the past 100 years. There is no evidence to support a dramatic change in the environmental conditions which would change this" (Murray 2012).

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- Robert Blyth, National Maritime Museum in Greenwich, England, concluded, “The wreck itself is the only witness we’ve now got of the *Titanic* disaster. All of the survivors have now passed away, so I think it’s important to use the wreck whilst the wreck still has something to say” (Daley 2019).
- In court testimony on February 20, 2020, both P.H. Nargeolet and David Gallo, *Titanic* experts, stated that there is no way to tell when *Titanic*’s decks may collapse, but cautioned that it could happen soon (Tr. 2/20/20 (ECF No. 599)).

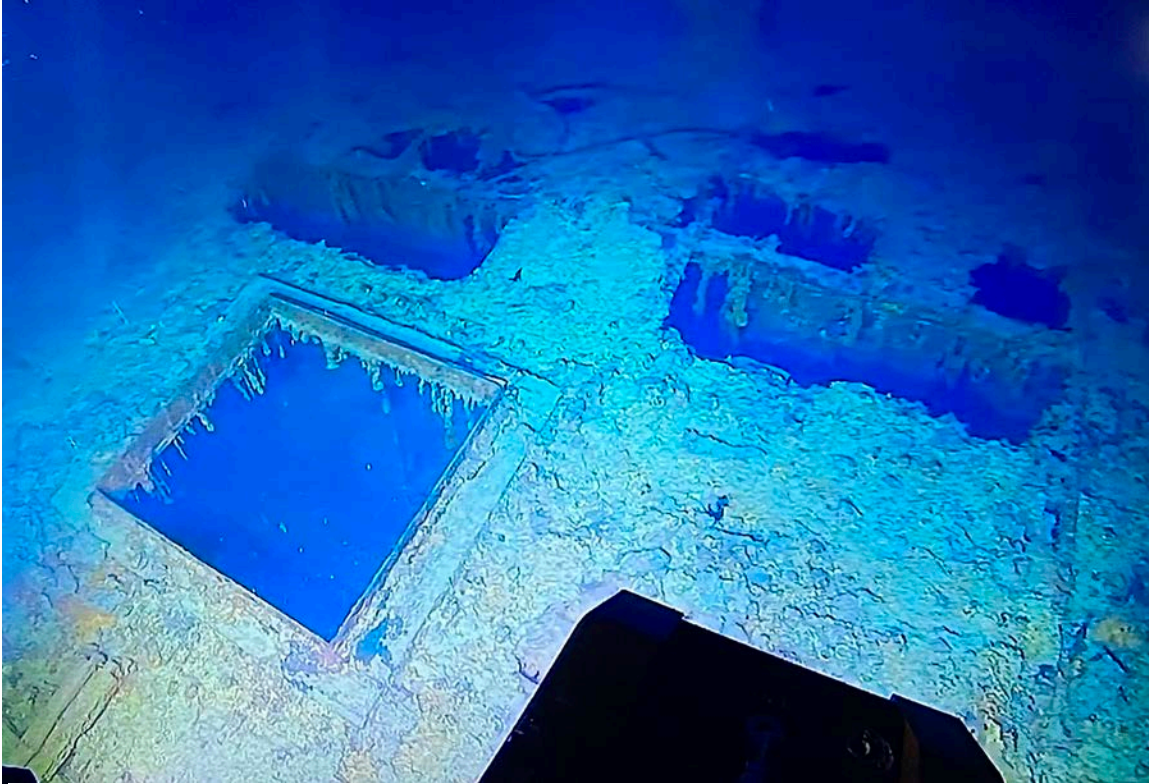
**What are the major changes that have been observed since *Titanic*’s discovery in 1985?**

In an effort to quantify the above observations and general predictions, we can examine some of the specific areas where noticeable changes to the hull have taken place in recent years:

- Daley reported in 2019, “Since the last time the ship was surveyed by people some 14 years ago, many recognizable features have disappeared into the abyss. The officer’s quarters, including the captain’s rooms, have vanished and the hull is beginning to collapse, taking the state rooms with it.” Daley continued, “In early August, crews aboard Triton submarine’s two-man submersible *Limiting Factor*, ... found is that the mass of metal is quickly deteriorating due to rust, salt, colonies of sea creatures and the constant flow of ocean currents.”
- William J. Broad, Science Editor at the *New York Times*, reported that the crow’s nest, where a lookout put out the famous warning “Iceberg right ahead!,” is gone, as well as the poop deck (Daley 2019).
- Noted *Titanic* historian Parks Stephenson, a member of the 2019 expedition science team, remarked in a press release, “The most shocking area of deterioration was the starboard side of the officer’s quarters, where the captain’s quarters were.... The Captain’s bathtub is a favorite image among the *Titanic* enthusiasts, and that’s now gone.” While onboard the research vessel in 2019, looking at the 2019 photomosaic model showing the new deterioration of the Marconi room area, he lamented, “We are definitely in a race against time here” (Atlantic Productions/National Geographic Channel, 2020, “Back to the *Titanic*”). See Figures 4 and 5.
- Video from the National Geographic special clearly shows gaping holes in the deck above a corridor adjacent to the Marconi Room, along with other, smaller holes in the deck directly above the Marconi Room (*Ibid.*)

The above reports document only a portion of the changes that have been observed on *Titanic* since the first survey in 1985. It is evident that most of those researchers most familiar with the *Titanic* wreck site are aware of significant deterioration of the hull since 1985. It is also evident that it is impossible to predict when additional catastrophic deck and





**Figure 4. Corroded openings in the deck above the Marconi Room in 2019.**



**Figure 5. Closeup of the skylight opening above the Marconi Room in 2019, showing holes corroded through the deck.**

bulkhead collapses will occur. It has been reported that most of the interior bulkheads, which were constructed of wood, have already disintegrated. Given the level of uncertainty, it would seem to be prudent to assume the worst and seek to identify high risk artifacts that might be recovered before it is too late. That was the decision made by NOAA for the *Monitor* National Marine Sanctuary.

### **A Comparison to the Wreck of USS *Monitor***

There are many similarities between the wreck of the Civil War ironclad warship USS *Monitor* and that of *Titanic*: both were built using riveted hull construction; both were considered unique at the time of their construction; both became more famous and mysterious because of their tragic losses; both wrecks are exposed on the seafloor, subjecting them to numerous destructive forces; and both are disintegrating due to galvanic corrosion, microbial action, and strong currents. The most significant similarity is that both wrecks lie exposed on the seafloor where they are vulnerable to the forces of nature—currents, storms, corrosion, erosion, burrowing animals and microbes, etc.—and human activities, including deep trawling and salvage (Figure 6). This extreme exposure automatically places both wrecks at high risk of accelerated deterioration.

When the wreck of USS *Monitor* was discovered in 1973, lying in 240 feet (73 m) of water off the coast of North Carolina, it was considered so highly significant that it became America's first National Marine Sanctuary, to be protected *in situ* by NOAA. Unlike the *Titanic* case, *Monitor* is U.S. property, given its status as a former U.S. Navy warship, so there were no legal issues surrounding the establishment of this form of protection for the wreck site. *Monitor* lies in much shallower water, which subjects it to higher dissolved oxygen content, the swift-flowing Gulf Stream, and the effects of storm and wave action. *Monitor* was a war grave, as evidenced by the remains of two sailors who were found within the recovered turret. Although a tragic number of *Titanic*'s passengers and crew lost their lives, the site environment appears to have consumed all human remains. Additionally, the USS *Monitor* used riveted construction methods and materials that are similar to those used on the RMS *Titanic*. Although 50 years older than the RMS *Titanic*, the rate of the USS *Monitor*'s deterioration and the efforts undertaken to recover and preserve its key components beginning 25 years ago may have relevance to *Titanic*'s situation.

After twenty years of studying and observing the site, it became apparent that the hull was losing its structural integrity at a rapidly increasing rate and that much of its historical fabric was going to be severely damaged or destroyed unless NOAA aggressively intervened. As a result of this determination, NOAA developed a long-range plan which documented the wreck's deterioration in great detail and presented a plan for stabilizing the hull before recovering several of the most unique and significant components so that they could be conserved and placed on exhibit for the public to appreciate and enjoy. Development of this plan received input from archaeologists, historic preservation managers, and marine engineers, as well as from the general public. Many of the most significant and recognizable components of the ship were recovered, including the



propeller, engine, gun turret and guns. Also recovered were two of *Monitor*'s crew, who had been trapped inside the turret during the sinking process. Thus, the wreck site was forever altered, but the USS *Monitor* serves as an example for which the application of *in situ* preservation proved not to be the best option (Broadwater 2012).



Figure 6. Wreck of USS *Monitor*, showing evidence of corrosion and hull collapse (NOAA).

### Legal and Ethical Considerations Revisited

Historic preservation managers are in general agreement that in developing a management and protection plan for a submerged archaeological site—underwater cultural heritage, in UNESCO terms—one should first consider the option of *in situ* preservation, that is, non-intrusive activities only. Although this option sounds good—save the site until such time as it is appropriate to investigate it—this policy often amounts to benign neglect. No archaeological site is completely stable; nature is always degrading the site, sometimes very slowly and other times more rapidly than may be apparent. It must be understood that every archaeological site is unique and must be evaluated according to the complex situation that exists at the time, and a management plan must reflect all the variables in that situation. A professional evaluation sometimes concludes that some form of intervention is warranted, be it burying or covering the site, providing other means of protection, careful site testing to gather more data, or partial or complete excavation.

Among the significant shipwrecks in North America for which recovery was selected over *in situ* preservation are the following:

- The Basque whaling ship *San Juan* (1567), excavated in Red Bay, Labrador;
- The French exploration ship *La Belle* (1686), excavated and recovered off the Texas coast through an international agreement between France and the U.S.;
- The pirate ship *Queen Anne's Revenge* (1718), excavated near the coast of North Carolina;
- The American privateer brigantine *Defence* (1779), excavated in Penobscot Bay, Maine;
- The British transport *Betsy* (1781), excavated in the York River, Virginia;

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- The Union warship USS *Monitor*, partially excavated and recovered off the coast of North Carolina; and
- The Confederate submarine *H.L. Hunley* (1864), raised off the coast of South Carolina.

These wrecks were selected for excavation by archaeologists, historic preservation managers and government agencies. The justifications varied, but in all cases, the management actions complied with the UNESCO Convention. A review of the text of that Convention, along with the Annex Rules (UNESCO 2001), reveals the criteria for management decisions:

**Rule 1.** The protection of underwater cultural heritage through in situ preservation shall be considered as the **first option. Accordingly, activities directed at underwater cultural heritage shall be authorized in a manner consistent with the protection of that heritage, and subject to that requirement may be authorized for the purpose of making a significant contribution to protection or knowledge or enhancement of underwater cultural heritage** (emphasis added).

**Rule 3.** Activities directed at underwater cultural heritage **shall not adversely affect the underwater cultural heritage more than is necessary for the objectives of the project** (emphasis added).

**Rule 4.** Activities directed at underwater cultural heritage must use nondestructive techniques and survey methods in preference to recovery of objects. **If excavation or recovery is necessary for the purpose of scientific studies or for the ultimate protection of the underwater cultural heritage, the methods and techniques used must be as non-destructive as possible and contribute to the preservation of the remains** (emphasis added).

These are the principal rules that guide management decisions that are to be reflected in a detailed site management plan, referred to as a research design. The Annex Rules provide an outline for developing an acceptable research design (UNESCO 2001, Section II, Rules 9 and 10). NOAA's Guidelines under the RMS Titanic Memorial Act are very similar to the UNESCO Convention text.

Specific guidance for decisionmaking includes determining if the proposed site disturbance is "justified by educational, scientific, or cultural interests," and "aligns with the public's interest." RMST believes that a video survey of the wreck's interior and removal of significant artifacts from the interior in a minimally intrusive manner will provide new scientific information that will be very useful in predicting future changes. RMST also believes that providing the public with new and exciting artifacts from the site is much more in alignment with the public interest than is a policy that allows the wreck to continue to disintegrate with no attempt to rescue part of its history and fabric.

RMST has taken the above information into account in developing this research design. Details of the planned 2020 expedition are presented below.

## **IV. PLAN FOR THE RMST 2020 EXPEDITION TO *TITANIC***

### **Overview of Expedition**

#### **General Assumptions for the Expedition**

RMST has compiled a wide range of information from expeditions to the wreck, including scientific analyses of site environmental conditions and samples, along with books and reports relating to the deterioration of *Titanic*'s hull and contents. RMST's expedition team has concluded that there is overwhelming evidence that portions of *Titanic*'s hull have weakened to the point that additional deck and bulkhead collapses could occur at any time, causing damage or destruction of objects within the hull. Based on that conclusion, this research design specifies a combination of video documentation and selective artifact recovery.

Significantly, RMST's expedition planning and research design have been prepared with an eye toward maintaining the integrity of the *Titanic* by leaving its superstructure unaltered. RMST is simply proposing to remove small sections of the badly corroded ¼ inch (6.35mm) thick deck that is also the ceiling of the Marconi Suite, and only if necessary to gain access to components of the Marconi apparatus located below these already weakened areas. This option is described below in more detail.

RMST cannot state with certainty that the Marconi Suite deck or ceiling will collapse within a specific time period; however, numerous scientific studies along with photographs and video acquired over a 35-year period document the accelerated collapse of nearby areas, suggesting that such a collapse is a very real possibility. Therefore, an additional consideration is that given such a high risk factor, there is merit in recovering the Marconi equipment at this time, when RMST has the financial capabilities and an expert crew and equipment available to complete the task. Assembling an expedition capable of recovering artifacts from within the hull with a minimum of collateral damage requires an incredible amount of effort and expense. There is no way to predict when or how another expedition with these capabilities could be mobilized. Subject to international health concerns brought on by the unforeseen COVID-19 pandemic, RMST is willing to and capable of conducting the recovery now.

#### **Justification for Recovery of the Marconi Wireless Telegraph Components**

As stated above, RMST believes that there is a preponderance of evidence to suggest that the Marconi equipment may be damaged or lost due to a deck collapse in the not too distant future. Preliminary evidence suggests that the Marconi equipment is accessible from above, through the boat deck, and at least some of its components could be extracted using the available personnel and equipment. The Marconi telegraph (Figure 7) is an iconic artifact that can help bring to life one of the most dramatic stories in the *Titanic* saga (see a detailed account in Appendix G). RMST considers that the educational and informational benefits to the public, through dissemination of expedition results and exhibit of the conserved artifacts, should weigh heavily in evaluating the appropriateness of recovering the targeted artifacts.

**Expedition Goals**

The primary goals for the 2020 expedition are:

1. Conduct minimally invasive, pre-disturbance video documentation of portions of the bow, with emphasis on the area in the vicinity of the Marconi Room;
2. Conduct minimally invasive video documentation of interior spaces in the bow;
3. Map and recover select artifacts from the debris field; and
4. If deemed to be feasible with minimal disturbance to the hull and little or no damage to the artifacts in question, map and recover components of the Marconi wireless telegraph system.



Figure 7. A replica of *Titanic's* Marconi Room (Wikipedia)

The expedition will document key exterior and interior areas with high-definition video to the extent that time and site conditions permit. Artifacts to be recovered from the debris field and within the hull that have been selected for their value as exhibition items and/or because of the likelihood that they will be damaged within the next decade or two if not recovered (see list, Appendix D).

**Proposed Phased Approach for the Expedition****General Planning Approach**

The expedition will proceed in a logical step-by-step fashion, although the schedule for specific tasks and activities may be altered due to factors such as weather conditions, equipment availability, or unexpected situations.

All tasks are planned to be minimally invasive for each goal. The initial video survey will be carefully reviewed, and the plan will be altered, if necessary, to adjust for actual



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observed site conditions. Specific planned tasks are as follows (see Appendix C for the detailed work plan):

**Task 1: Initial Pre-Disturbance Video Survey**

- a. A remotely-operated vehicle (“ROV”) will conduct a high definition video survey of portions of the bow, with the extent of coverage to be determined by site and equipment conditions and time constraints.
- b. A priority for the video survey will be close up imagery of the deck area over the Marconi equipment rooms, plus imagery inside the Marconi equipment rooms to the extent that task can be accomplished with minimal disturbance.
- c. Additional interior and exterior video will be recorded as time and conditions permit.

**Task 2: Selective Artifact Recovery in the Debris Field**

- a. An ROV will be used to recover artifacts from the debris field that have been preselected from information generated on previous expeditions; objects of opportunity may also be recovered if they meet the criteria in the Conservation Plan (Appendix D).
- b. Artifacts will be placed in pre-positioned recovery baskets.
- c. All recovery operations in the debris field will be recorded on high definition video along with positioning information.
- d. A task log will be maintained during all recovery operations.

**Task 3: Selective Recovery of Marconi Telegraph Components (To be decided on site)**

- a. Based on the video survey, team leaders will decide if recovery of one or more components of the Marconi telegraph system can be accomplished with minimal adverse effects on *Titanic*’s hull and contents.
- b. If recovery is determined to be feasible, the recovery plan will be refined based on information obtained during the video survey.
- c. Once recover operations begin, the situation will be closely monitored by the expedition archaeologist and other senior team members. If there is a threat of excessive wreck or artifact damage, operations will be halted and the senior team will confer about the situation. Operations will resume only if the senior team is in agreement that they can proceed in a minimally-invasive manner.
- d. An ROV-mounted suction dredge may be employed, if appropriate, for exposing components of the Marconi system or for investigating the condition of the Marconi spaces.

Note: See the detailed work plan, Appendix C, for more information.

## V. RESEARCH AND MANAGEMENT QUESTIONS

### Research Approach

The 2020 Expedition is an opportunity for RMST to add to the growing body of knowledge about the *Titanic* wreck site. The company desires to conduct meaningful and responsible research at the site and to make the resulting data freely available to all segments of society, from scientists and engineers to all the world's citizens. *Titanic* continues to generate excitement, as evidence by the fact that the National Geographic Channel recently aired three *Titanic* programs back-to-back, and two of them were new. RMST believes that the public benefits from this research, directly or indirectly; by the same token RMST believes that telling *Titanic*'s story through the use of actual artifacts from the site heightens the level of interest and excitement that the ship generates. It is for these reasons, along with consideration of the perceived threat to the artifacts, that RMST plans to combine site documentation with artifact recovery.

### Research and Management Questions to be Addressed

The following questions will be addressed during the planned expedition and during post-expedition analysis and publication. Additional questions may be posed as the study progresses.

1. Can new evidence of degradation of hull or contents be identified and documented?
2. Is there evidence of imminent deck or bulkhead collapse in the bow, particularly in and around the area where the Marconi equipment is located?
3. Are there areas where the hull can be safely entered by an ROV to document interior spaces with high definition video footage?
4. Are there newly exposed artifacts within the debris field that can provide evidence of bottom disturbance and artifact mixing due to the action of currents, burrowing or foraging animals, or, possibly, human activities?
5. Do artifacts within the debris exhibit any patterning that may suggest what part of the ship they came from, possibly helping refine our model of the wrecking and site formation processes? (Note: Numerous patterns have already been identified.)
6. Can components of the Marconi wireless telegraph system be viewed from the deck above and can their condition and accessibility be evaluated?
7. Can components of the Marconi wireless telegraph system be recovered without undue collateral damage to the hull and contents?

## VI. METHODOLOGY AND EQUIPMENT

**Please see appendices for details on Methodology (Appendix C) and Primary Equipment (Appendix F).**

The expedition will be conducted from a sea-capable research and recovery vessel with capabilities for dynamic stationkeeping, ROV operations, and accommodations for crew and the science party. Two work-class ROVs will be deployed on most working dives to

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provide complete video coverage and to expedite accomplishment of tasks. At least one ROV will be equipped with a versatile, interchangeable tool suite designed to meet the type of needs anticipated for the expedition. Other equipment includes recovery baskets and artifact storage containers.

The expedition team will consist of experienced and highly skilled personnel for vessel operations, ROV operations, marine engineering, videography, maritime archaeology, archaeological conservation, and others, as required.

## **VII. EXPEDITION MANAGEMENT, SAFETY AND ENVIRONMENTAL CONSIDERATIONS**

### **Policies**

In order to promote health, safety and accident prevention expedition leaders will maintain a strong and unwavering commitment to high quality standards and practices. These topics are introduced to all new personnel upon joining the vessel, as well as being regularly discussed during operations.

### **Safety**

Personnel safety will be the most important priority for all field work. Personnel will be assigned responsibilities for safety at the dock, on the vessel, and in the water. Care will be taken to minimize safety hazards and to promote safe practices during all phases of the project.

### **Environmental Considerations**

Care will be taken to avoid causing any adverse environmental impacts during on-site activities. None of the planned activities is expected to adversely affect the benthic ecosystem in any way.

### **Health, Safety, and Environment Quality Controls**

Prior to mobilization a detailed project Hazard Identification (“HAZID”) will be held for all senior managers and expedition leaders. A related document will detail - operations from project planning through mobilization, expedition operations, and finally to demobilization and data deliverables. The HAZID will be reviewed by all relevant personnel prior to the commencement of the mobilization and will form the basis of the expedition task risk assessments. In addition, it will identify any specialty or specific equipment not currently defined within the expedition contract.

### **Vessel Induction**

All new personnel joining the vessel either as crew, expedition personnel, or short-term workers shall be required to undertake a vessel induction appropriate for their length of stay on the vessel.

Research Design: RMS Titanic Expedition 2020 – 24 MAR 2020**Risk Assessments**

Each individual work task shall have a risk assessment, job safety analysis (“JSA”), and toolbox talk (“TBT”) performed by all parties involved in the operation. The very nature of the TBT may require the revision of the risk assessment. All these documents will be performed prior to the application of the permit to work.

**Safety Meetings**

Daily meetings will be held on board with all heads of department where safety points, operations, and logistics will be discussed. Safety meetings and safety audits will also be performed on a regular basis.

**Documentation**

All policies and relevant documents can be reviewed upon request.

**VIII. PROJECT TIMETABLE**

Target Expedition Start Date:	August 30, 2020
Anticipated End Date:	September 30, 2020

**IX. KEY PROJECT ROLES AND PERSONNEL**

**Note: See Appendix D for detailed resumes.**

**A. Pierre Henri (“PH”) Nargeolet, *RMST Director of Underwater Research*  
Co-Expedition Leader**

RMS *Titanic* expedition leader - 1987, 1993, 1994, 1996, 1998, 2010. These expeditions recovered more than 5,000 artifacts from *Titanic* and its debris field, and his team conducted some of the most comprehensive recovery dives and full surveys of the *Titanic* wreck site.

**B. David Gallo, Ph.D., *RMST Senior Advisor of Strategic Initiatives*  
Co-Expedition Leader**

David Gallo has been at the forefront of ocean exploration for more than 40 years. He was co-expedition leader (with PH Nargeolet) during the successful search for Air France 447 and the 2010 expedition to create the first comprehensive map of RMS *Titanic*.

**C. John D. Broadwater, Ph.D., *President and Founder of Sprintsail Enterprises*  
Senior Marine Archaeologist**

John Broadwater has been a leader in marine archaeology for more than 40 years. During 2007-10, Dr. Broadwater was chief archaeologist in NOAA’s Office of National Marine Sanctuaries and manager of NOAA’s Maritime Heritage Program. He was the archaeological observer during the 2001 *Titanic* Expedition.

**D. William Lange, *E/M Group Consultant***  
**Director of Advanced Imaging and Visualization**

William Lange was one of the first people to locate and visualize the *Titanic* wreck site on the 1985 discovery expedition, he has participated in over ten expedition projects to *Titanic*, and he has worked on dozens of documentary films about the *Titanic*. Lange also directed the survey, imaging and mapping of the *Titanic* on the RMST 2010 expedition.

**E. Troy Launay, *Founder, TR LaunaY Inc.***  
**Salvage Team Leader**

Troy Launay has worked in the advanced technologies sector for over 30 years, serving as a senior technician and project manager for Oceaneering International, a global company providing deep-water applied technology expertise to the offshore oil and gas, defense, entertainment, and aerospace industries. His significant historic artifact recoveries include expeditions to the RMS *Titanic* and leading the salvage team for the recovery of the Apollo F-1 engines.

**F. Alexandra Klingelhofer, *Executive Director of Collections, E/M Group***  
**Artifact Preservation & Conservation Team Leader**

Alexandra Klingelhofer is a nationally recognized museum professional with a rare combination of conservation and curatorial experience across diverse archaeological, art and humanities collections. She is an expert in collections management, preservation and interpretive use with proven ability to create high-impact learning experiences..

**G. David Concannon, Esq., *Explorer Consulting and Concannon & Charles***  
**Legal and Operational Advisor**

David Concannon is an attorney and the founder of Explorer Consulting, a highly specialized consulting practice that advises clients on “the business of exploration.” Concannon has 22 years of legal and operational expertise related to *Titanic*, including leading or participating in three expeditions to salvage, film and explore the wreck site (which he has dived to four times); and advising salvors, filmmakers and explorers in conducting ten expeditions. He organized and led the Apollo F-1 Search & Recovery Project for Bezos Expeditions, including the expeditions that found the remains of eight Apollo missions in 2011 and recovered the F-1 engines from four Apollo lunar missions in 2013.

## **X. DATA ANALYSIS AND MANAGEMENT**

### **Video Data**

Initial viewing and processing of digital video will take place in real time and after every dive. Frame grabs and georeferencing information will be extracted as appropriate for refining plans for subsequent dives. All video data will be carefully logged, labeled, and backed up for security.

**Positioning (Georeference) Data**

Initial viewing and processing of digital video will take place in real time and after every dive. Frame grabs and georeferencing information will be extracted as appropriate for refining plans for subsequent dives. All video data will be carefully logged, labeled, and backed up for security.

For further information about RMST's data analysis and management, please refer to RMST's "Collections Management Policy," filed in the U.S. District Court on May 23, 2019 (ECF No. 550-4).

**XI. CONSERVATION FACILITIES AND METHODOLOGY**

RMST's conservation plan complies with industry standards for laboratory facilities, professional staff, and methodology. Information about RMST's Conservation Facilities and Personnel, and Conservation Methodology, are set forth at length in its "*Titanic* Artifact Collections Strategic Plan 2019-2022," and "Collections Management Policy," filed in the U.S. District Court on May 23, 2019 (ECF 550-3 and 550-4). Both documents are incorporated herein by reference. Also, see more details in Appendix D.

**XII. CURATION OF ARTIFACTS AND RECORDS**

RMST has developed the "Artifact Collections Strategic Plan 2019-2022" that details the company's plan for acquiring, processing, storing, and exhibiting artifacts it recovers from the *Titanic* wreck site. The primary mission of RMST the preservation and use of the *Titanic* Artifact Collection to educate future generations about the tragic story, and the stewardship of the wreck site. By extension, stewardship includes the development and safeguarding of documentation related to expeditions, scientific analysis, artifact research, and all internally developed intellectual property that contributes to a more complete understanding of all aspects of *Titanic*.

The *Titanic* Artifact Collection is managed by the RMST Department of Collections. It is a stand-alone department which reports directly to the E/MGroup CEO. As an affiliate of Experiential Media Group, LLC, and a subsidiary of PAHL, RMST's Vice President of Collections is in charge of the *Titanic* Collection and retains a place in upper management to provide a voice for the preservation, management, and future of the *Titanic* Collection, as well as ensuring that the Collection is represented in discussions of non-*Titanic* E/M Group projects.

RMST's overall collections goal is the preservation, management, and protection of all artifacts recovered from *Titanic* and in the possession of RMST. Specific goals include



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abiding by industry standards and the American Association of Museums Best Practices, expanding the *Titanic* Mapping Project, maintaining a comprehensive database, conducting scientific analyses, and conducting ongoing research.

RMST has also developed a closely related document, the “Collections Management Policy.” The primary mission of the RMST Collections Department is the preservation and use of the *Titanic* Artifact Collection to educate future generations about the tragic story. By extension, stewardship includes the development and safeguarding of documentation related to expeditions, scientific analysis, artifact research, and all internally developed intellectual property that contributes to a more complete understanding of all aspects of *Titanic*. RMST has sought and will continue to seek to preserve and promote the memory of the *Titanic* with dignity and respect, and with due regard to *Titanic*’s historical and maritime significance.

Note: Information about RMST’s Curation of Recovered Cultural Material, and Curation of Digital and Paper Records, are set forth at length in its “*Titanic* Artifact Collections Strategic Plan 2019-2022,” and “Collections Management Policy,” filed in the U.S. District Court on May 23, 2019 (ECF 550-3 and 550-4). Both documents are incorporated herein by reference.

### **XIII. DISSEMINATION OF EXPEDITION DATA**

#### **Reports and Publications**

Contributions to Reports and Publications will be made in accordance with the standards set forth in RMST’s “Collections Management Policy,” filed in the U.S. District Court on May 23, 2019 (ECF 550-4). In particular, specific provisions regarding RMST’s Media Library address this topic, and are incorporated herein by reference.

#### **Social Media**

Real-time coverage of expedition  
Ongoing coverage of analysis and reporting

#### **Publications and Exhibitions**

Expedition Report  
Exhibition of key artifacts  
Dissemination and access to these documents will be governed by RMST’s “Collections Management Policy,” which is incorporated herein by reference.

#### **Museum Exhibits**

RMST’s plans for Museum Exhibitions are set forth at length in RMST’s “Collections Management Policy,” and are incorporated herein by reference.

For further information about RMST’s plans for dissemination of expedition data, please refer to RMST’s “Collections Management Policy.”

#### **XIV. PROJECTED BUDGET**

The projected budget for RMST's 2020 Expedition and related expenditures are proprietary. RMST attests that it possesses the financial resources to conduct the proposed expedition and to properly conserve and curate all recovered cultural material.

#### **XV. APPENDICES**

See following pages.

## Appendix A: References Cited

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## **Appendix B: Resumes of Key Personnel** (alphabetical order)

### **John D. Broadwater, Ph.D., *President and Founder of Sprintsail Enterprises*** **Senior Marine Archaeologist**

John Broadwater has been a leader in marine archaeology for more than 40 years. During 2007-10, Dr. Broadwater was chief archaeologist in NOAA's Office of National Marine Sanctuaries and manager of NOAA's Maritime Heritage Program, a new program that he helped create. From 1992, he was manager of the Monitor National Marine Sanctuary, directing seven major expeditions to the remains of the Civil War ironclad USS *Monitor*. During 1978-90, as senior underwater archaeologist at the Virginia Department of Historic Resources, Dr. Broadwater directed a study of shipwrecks from the Battle of Yorktown, 1781. He has participated in numerous national and international archaeological expeditions, including deep archaeology expeditions in the Black Sea and North Atlantic. In September 2001, he descended in the *Mir 2* submersible to explore the wreck of the RMS *Titanic*. John has served on numerous archaeological advisory boards and is a Fellow in The Explorers Club. He has published a variety of technical and popular articles and contributed to numerous archaeology books and encyclopedias. He has a master's degree in American Studies from the College of William and Mary, and a Ph.D. in Maritime Studies from the University of St. Andrews, Scotland.

### **David Concannon, Esq., *Explorer Consulting and Concannon & Charles*** **Legal and Operational Advisor**

David Concannon is an attorney and the founder of Explorer Consulting, a highly specialized consulting practice that advises clients on "the business of exploration." Concannon has extensive experience in this area, having served as the General Counsel to The Explorers Club, where he is a Fellow National, the X-Prize Foundation, the Anglo-Danish Maritime Archaeology Team, and others. Concannon has 22 years of legal and operational expertise related to the R.M.S. *Titanic*, including leading or participating in three expeditions to salvage, film and explore the wreck site (which he has dived to four times); and advising salvors, filmmakers and explorers in conducting ten expeditions. Concannon also organized the Apollo F-1 Search & Recovery Project for Bezos Expeditions, where he led the expeditions to find and recover the Apollo F-1 rocket engines that launched men to the moon, initiated conservation of the artifacts recovered, and assisted in their public display. In 2014, Concannon and his Apollo F-1 team were awarded The Explorers Club Citation of Merit for "an outstanding feat of exploration." This is the same recognition given to Dr. Robert Ballard for the discovery of the *Titanic* in 1985.



**David Gallo, Ph.D., *RMST Senior Advisor of Strategic Initiatives***  
**Co-Expedition Leader**

David Gallo has been at the forefront of ocean exploration for more than 40 years. He was co-expedition leader (with PH Nargeolet) during the successful search for Air France 447 and the 2010 expedition to create the first comprehensive map of RMS *Titanic*. He was one of the first scientists to use both robots and submarines together to explore and map the deep sea floor. His TED presentation “Underwater Astonishments” has attracted 11 million views, placing it among the Top Ten. He is a member of James Cameron’s Deep Ocean Task Force. Dr. Gallo is dedicated to communicating the excitement of discovery to audiences from K-CEO. He is a TED Conference All-Star, a CNN analyst, and recipient of numerous medals and awards including the 2014 Lowell Thomas Award from The Explorers Club, where he is a Fellow National.

**Alexandra Klingelhofer, *Executive Director of Collections, E/M Group***  
**Artifact Preservation & Conservation Team Leader**

Alexandra Klingelhofer is a nationally recognized museum professional with a rare combination of conservation and curatorial experience across diverse archaeological, art and humanities collections. She is an expert in collections management, preservation and interpretive use with proven ability to create high-impact learning experiences. Ms. Klingelhofer has served as a conservation and museum consultant with specialties in assessing and conserving diverse collections for major cultural institutions (Colonial Williamsburg Foundation, Biltmore House) and museums (Drayton Hall, Michael C. Carlos Museum, Atlanta History Center). Contributing to the profession, she has served as both a field peer and panel reviewer for *Save America’s Treasures* federal grant program and Institute for Museum and Library Services Conservation Project Grants. Ms. Klingelhofer received her Bachelor of Arts degree in Biblical Archaeology from the University of North Carolina at Chapel Hill, highlighted by induction into Phi Beta Kappa. She received her Masters of Science in Conservation and Archaeological Site Science from the University of Southampton, United Kingdom. She is a Professional Associate of the American Institute for Conservation.

**William Lange, *E/M Group Consultant***  
**Director of Advanced Imaging and Visualization**

William Lange, a veteran of over 100 scientific expeditions and documentary projects, is a world-renowned expert in underwater imaging systems and camera system design. Lange was Director of the Advanced Imaging and Visualization Laboratory at the WHOI, for over 35 years. Lange was one of the first people to locate and visualize the *Titanic* wreck site on the 1985 discovery expedition, he has participated in over ten expedition projects to *Titanic*, and he has worked on dozens of documentary films about the *Titanic*. Lange also directed the survey, imaging and mapping of the *Titanic* on the RMST 2010 expedition.

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**Troy Launay, Founder, TR LaunaY Inc.**  
**Salvage Team Leader**

Troy Launay has worked in the advanced technologies sector for over 30 years. A certified commercial diver, he started his career in the offshore construction industry and was trained in air, mixed gas, and saturation diving. He completed numerous pile restoration, pipeline maintenance, and other marine service projects as an inland and offshore commercial diver. Prior to founding TR LaunaY Inc., he served as a senior technician and project manager for Oceaneering International, a global company providing deep-water applied technology expertise to the offshore oil and gas, defense, entertainment, and aerospace industries. Responsible for the fabrication, operation, and maintenance of both electrical and mechanical systems used for deep ocean search and recovery operations, Troy gained extensive experience in operating side scan sonars and ROVs, laying subsea cables, and handling salvage equipment. His significant historic artifact recoveries include expeditions to the RMS *Titanic* and leading the salvage team for the recovery of the Apollo F-1 engines.

**Pierre Henri (“PH”) Nargeolet, RMST Director of Underwater Research**  
**Co-Expedition Leader**

RMS *Titanic* expedition leader - 1987, 1993, 1994, 1996, 1998, 2010. These Expeditions recovered more than 5,000 artifacts from *Titanic* and its debris field, and his team conducted some of the most comprehensive recovery dives and full surveys of the *Titanic* wreck site. Nargeolet also led the team responsible for locating the wreckage of Air France flight 447, lost in the Atlantic Ocean en route from Buenos Aires to Paris in 2010. A former French Navy commander, Nargeolet has decades of experience at sea locating, investigating, and recovering shipwreck and aircraft.

## **Appendix C: Detailed Site Description and Recovery Plan**

### **1. Expedition Methodology**

#### **General Methodology**

The expedition will involve a wide range of equipment, personnel, and techniques in meeting its goals. Among the primary activities are ship operations, remotely operated vehicle (“ROV”) operations, systematic surveys, assessment of structural changes, identification and selection of artifacts for recovery, *in situ* documentation, artifact recovery, and artifact processing (shipboard handling, documentation, stabilization, and packaging; offloading, customs and transportation of artifacts; and conservation and curation).

Expedition staff will conduct all operations in a sensitive manner befitting RMS *Titanic* as a maritime memorial, and to reduce negative impacts to cultural materials and the associated marine environment. In addition, staff will collect basic information (position coordinates, imagery, field notes) about *in situ* artifacts selected for recovery. Artifacts recovered from the site will receive shipboard documentation and stabilization, and will be properly packaged for transport to the appropriate conservation facility. Information about recovered artifacts will be archived in the RMST collections database.

#### **Vessel Capabilities and Operations**

The expedition will be conducted from a sea-capable research and recovery vessel capable of stationkeeping (dynamic positioning), ROV operations, and deployment and recovery of artifact recovery baskets and other equipment, as required (see Appendix F). The vessel will have the following capabilities: a fully equipped bridge with skilled personnel, precise global positioning system (“GPS”), and precision navigation system; a machine shop and crew capable of fabricating tools and making repairs, as required; an electronics shop for maintenance and repair of the ROV, camera systems, and other equipment, as required; facilities and support for the crew and scientific party. The ship will also support the operation of two work-class ROVs.

Operations will be conducted 24 hours per day, seven days per week, weather and other conditions permitting. The operating day will be divided into two watches, or shifts: noon to midnight and midnight to noon. A “handover” will occur at each change of watch to ensure that the oncoming watch team is made aware of the currently active tasks and status. Following dinner, the expedition senior team will meet to review progress, identify issues requiring resolution, and revise upcoming goals and tasks.

A watch bill (shift assignments) will be established prior to arrival on site. Logbooks will be used to record standard information and other observations about recovered artifacts as well as certain artifacts left on-site for future recovery.

#### **ROV Capabilities and Operations**

The expedition will utilize two work-class ROVs that will generally operate in tandem, increasing expedition effectiveness and providing a camera platform to thoroughly

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document all recovery operations. Both ROVs will be equipped with camera systems and at least one will be fitted with a flexible and modifiable suite of tools for recovery. Whenever possible ROV operations will be conducted 24/7, utilizing one or both ROVs, depending upon goals and conditions. The ROVs are critical to every aspect of expedition operations, especially since the expedition will not employ a human occupied submersible.

The ROV operation team includes a pilot and co-pilot for each ROV, a shift supervisor, a navigator, and a project manager (“floater”) for each 12-hour shift. In addition, there will be one or two personnel from RMST observing ROV operations during each work shift. RMST personnel will provide video narration, maintain the video log, and guide decision-making on selection of artifacts for recovery. The archaeologist and conservator will assist in information collection and quality assurance associated with cultural materials.

It is worth noting that even though the ROVs each weigh several tons, they are designed to move about in an essentially “weightless” manner. Their precise “fly by wire” computer-controlled propulsion systems enable them to land on a surface with just enough downward force to maintain position, thus minimizing any potential adverse effects. The skids on which the ROVs sit will be padded to provide extra protection.

## **2. Goal One: Pre-disturbance Video Survey – Bow Area**

- Upon Arrival at Site: Review Work Parameters
  - Establish stationkeeping over *Titanic*’s bow.
  - Determine if workable weather limits are predicted for at least a one-day period.
  - Determine if ocean currents are within workable limits for operating both ROVs simultaneously.
  - Verify that all necessary equipment is in good operating condition.
- General Video Inspection
  - Place the research vessel in a stable station keeping position over *Titanic*’s bow.
  - Dive one or both ROVs to the site.
  - Perform a general video inspection of the bow area, with emphasis on the Marconi Suite:
    - Conduct video inspection of the deck above the Marconi Suite,
    - Conduct non-disturbance video inspection of the interior of the Marconi and Silent Rooms, and
    - Conduct additional exterior and interior video surveys as time and site conditions permit.
  - Verify integrity of superstructure, identify potential obstructions/hazards.
  - Document any notable changes in the wreck since last observed.
- Structural Assessment
  - Review video in real time and later, as time permits, in an effort to identify structural changes to *Titanic*’s hull and artifacts.

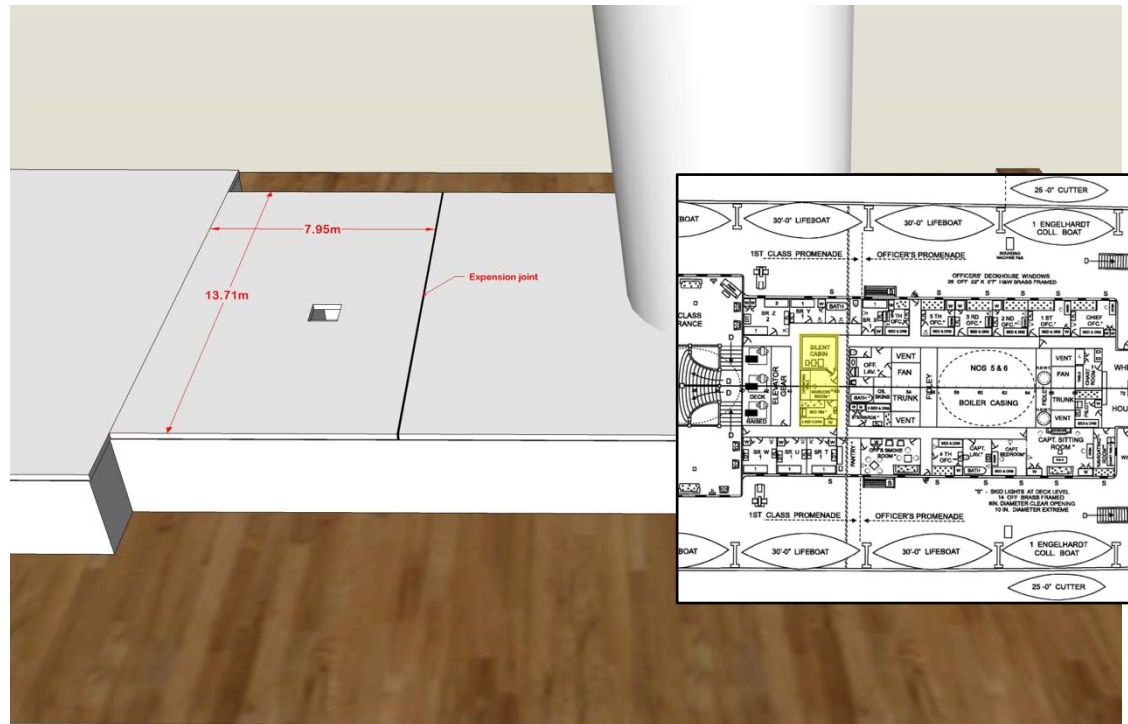
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Figure 1. Marconi Suite -- General work area (bow to right)

### 3. Goal Two: Artifact Recovery – Debris Field

#### Selection of Artifacts for Recovery

Selection of artifacts for recovery will be based on: (1) uniqueness of the artifact, (2) contribution to the understanding of the ship, passengers, and life on board (3) technical considerations, and (4) any conditions specified by the U.S. District Court for the Eastern District of Virginia, Norfolk Division. On-site RMST personnel will be responsible for recovery decisions. RMST's Executive Director of Collections in collaboration with other *Titanic* experts have prepared an annotated list of possible targets for artifact recovery. This list will guide selection of artifacts for recovery. Other artifacts will be recovered on a case-by-case basis. Their selection will be based on uniqueness, significance, and relevance to the RMST's study of the ship, historical and archaeological importance and contributions to the public exhibition program.

The ROV operation team will participate in decision-making as it relates to the technical feasibility of recovering particular artifacts. The underwater archaeologist and conservator will provide input in technical aspects of recovery that will ensure that impacts to cultural materials and the associated marine environment will be minimally intrusive. The expedition senior team will be responsible for overseeing recovery efforts at the site and final selection of artifacts for recovery.

#### In Situ Documentation

The ROVs will be equipped with multiple video cameras and at least one will have a high definition video camera and a digital still camera. These combinations of cameras will



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ensure good visibility for ROV operators and the recovery team as well as provide a high quality permanent record of all ROV operations, especially during recovery operations, when both ROVs will be utilized. Both ROVs will be tracked by means of hull-mounted sensors and ROV-mounted transponders.

Documentation of *in-situ* artifacts (i.e., prior to disturbance) will include the recording of position coordinates, close-up images, images that include adjacent cultural materials and environmental features, and associated field notes. Images that include identifiable nearby cultural materials and environmental features will provide additional information on artifact provenience to supplement position coordinates and place the artifacts in more definable contexts. The ROV operation team will also establish position coordinates on cultural materials, environmental features, and other “landmarks” that have been precisely located during previous expeditions. This will provide some capability for correcting position coordinates, if necessary, and relating them to results of past expeditions.

**Artifact Recovery**

Selective recovery of artifacts will be accomplished with an ROV manipulator fitted with a tool suitable for the type of object being recovered. The team will conduct recovery operations in a careful manner to reduce damage to the artifacts as well as other nearby cultural materials and environmental features. Artifacts will be placed in a centrally located recovery basket for retrieval as needed to the research vessel. Artifacts will be carefully unloaded on deck from the recovery basket by expedition staff, and immediately placed under the responsibility and care of the RMST collections staff. Initial documentation will include completing an object report and photography with scale.

**Post-Expedition Conservation and Curation**

Long-term conservation and curation of artifacts recovered from the site of RMS *Titanic* will be completed at appropriate conservation facilities with temperature and humidity-controlled storage, security, professional staff, and the capability to process artifacts of all types. Conservation treatment proposals will be reviewed with conservators and management to ensure continuing care and stewardship of the artifacts (see Appendix D).

- **Review Work Parameters**
  - Determine if workable weather limits are predicted for at least a three-day period
  - Determine if ocean currents are within workable limits for operating both ROVs simultaneously
  - Verify that all necessary equipment is in good operating condition
- **Recovery Operations in the Debris Field**
  - Deploy both ROVs to primary recovery area
  - Stage the observation ROV above the recovery ROV to document any recoveries where this method is necessary to ensure complete video coverage of the recovery
  - Utilize both ROVs to conduct independent recovery operations when appropriate
  - Follow pre-prepared artifact list to guide the recovery operation
  - Recover artifacts not on the list if approval is given by the senior team

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- If recovery is likely to significantly damage an artifact, it will be left in place

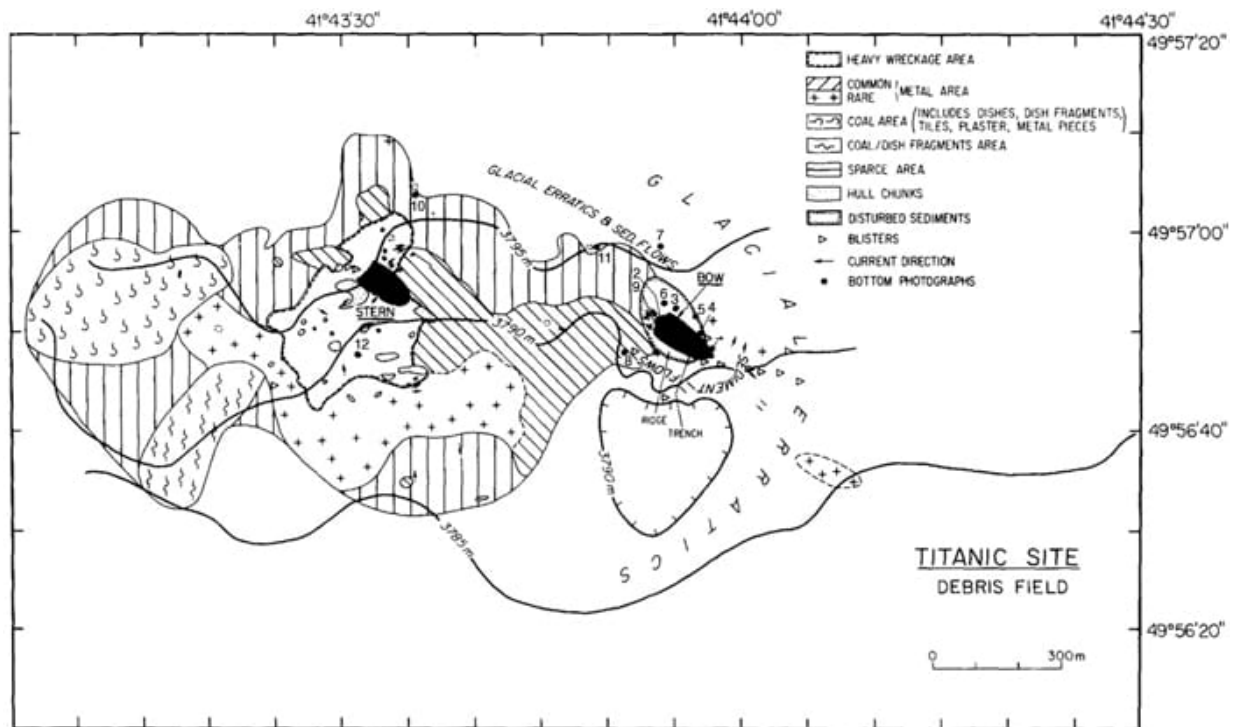


Figure 2. Map of the debris field (Woods Hole Oceanographic Institution)

#### 4. Goal Three: Artifact Recovery—Marconi Wireless Telegraph Equipment (Optional)

*Thanks to Park Stephenson, Ken Marschall and James Cameron for the CGI and wreck imagery that appears in this report.*

##### DESCRIPTION (OVERVIEW)

This plan describes procedures for recovering artifacts from *Titanic*'s Marconi Suite. This goal will be attempted only after a thorough review of the situation on site by the senior expedition team. Possible Marconi components to be recovered include:

From the Marconi Room:

Operators' equipment (key, spark gap apparatus, clock, etc.)

From the Silent Room:

- 1) Motor-generator set with disc discharger
- 2) wall-mounted switchboards and regulators (2 of each)
- 3) Spiral Inductance
- 4) Tuning Lamp and Earth Arrester
- 5) Low Frequency Inductance

##### LOCATION AND DESCRIPTION OF MARCONI SUITE

The artifacts of interest are all contained in the former "Silent Room" of the Marconi

Suite. The Marconi Suite itself was contained in a steel deck house [atop the Boat Deck ?] in the vicinity of First-Class cabins and Deck Officers' accommodations, just aft of Funnel 1 (yellow arrow, Figure 3).



Figure 3. Location of Marconi Suite within Bow Section (viewed from starboard side, aft).

## DESCRIPTION OF MARCONI SUITE

This suite originally consisted of three compartments: Sleeping Accommodations, an Operator's Room, and a Silent Room with soundproof walls to contain the noise made by the telegraph equipment. The compartments were separated by wooden partitions that have now almost completely disintegrated, leaving the equipment exposed in the former Silent Room (tinted pink, Figure 4)



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An overhead skylight originally vented the sleeping quarters and operator's office (tinted green in Figure 4). This skylight is now open, offering one access into the Marconi Suite. The well formally occupied by the Grand Staircase is located aft of the Marconi Suite; it is now a deep vertical shaft that does not appear to be a viable access point. There is an intact steel bulkhead separating the staircase from the Marconi Suite, with only two standard size door apertures for access.

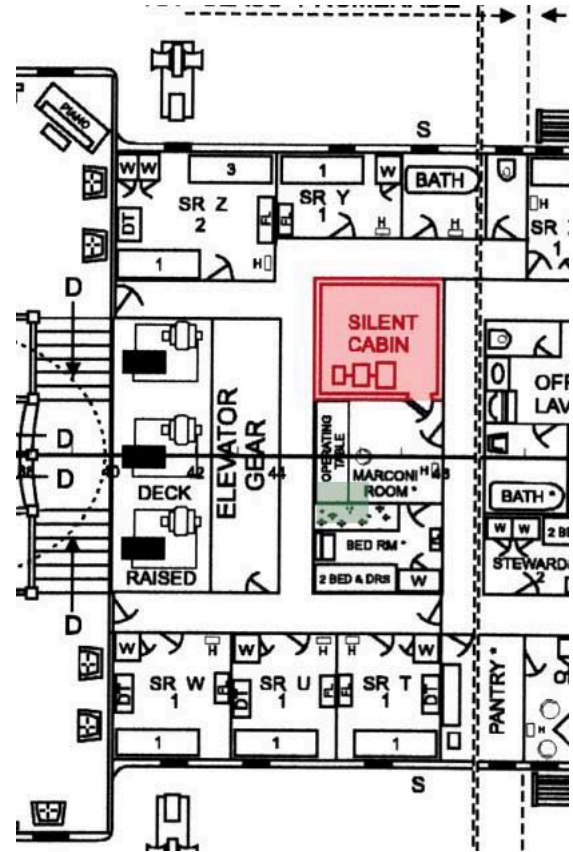


Figure 4. Plan view showing Marconi suite (direction of bow is right).

Figure 5 is an artist's illustration of the same area seen in the plan view (Figure 2), showing the location of the Marconi Suite in relation to the Grand Staircase and deck house. There are no other structures above or to the sides of the skylight, so an ROV can approach with unobstructed access.

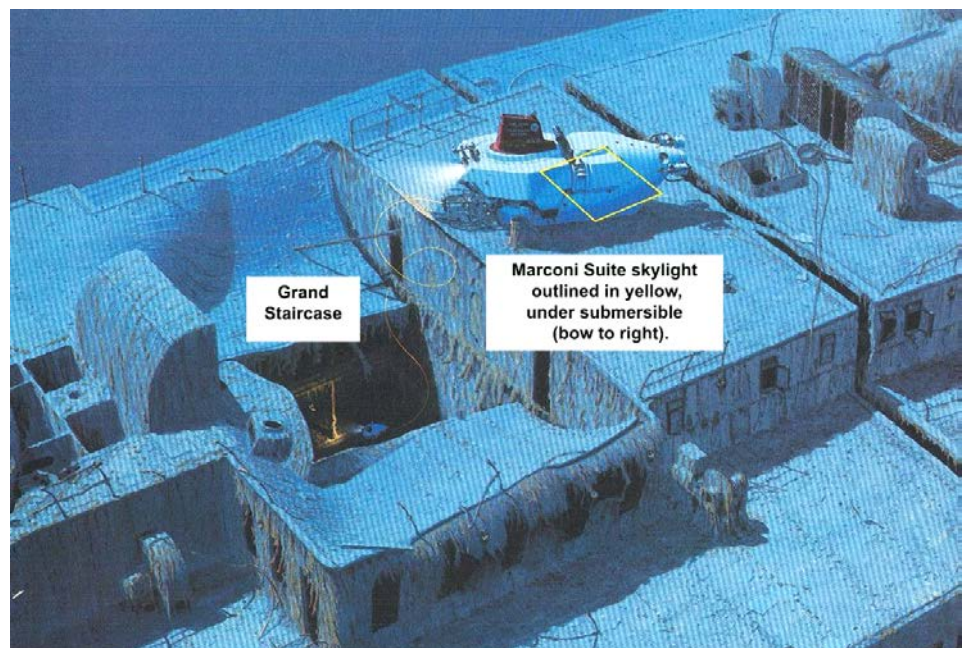


Figure 5. Location of Marconi skylight relative to Grand Staircase and deck house.



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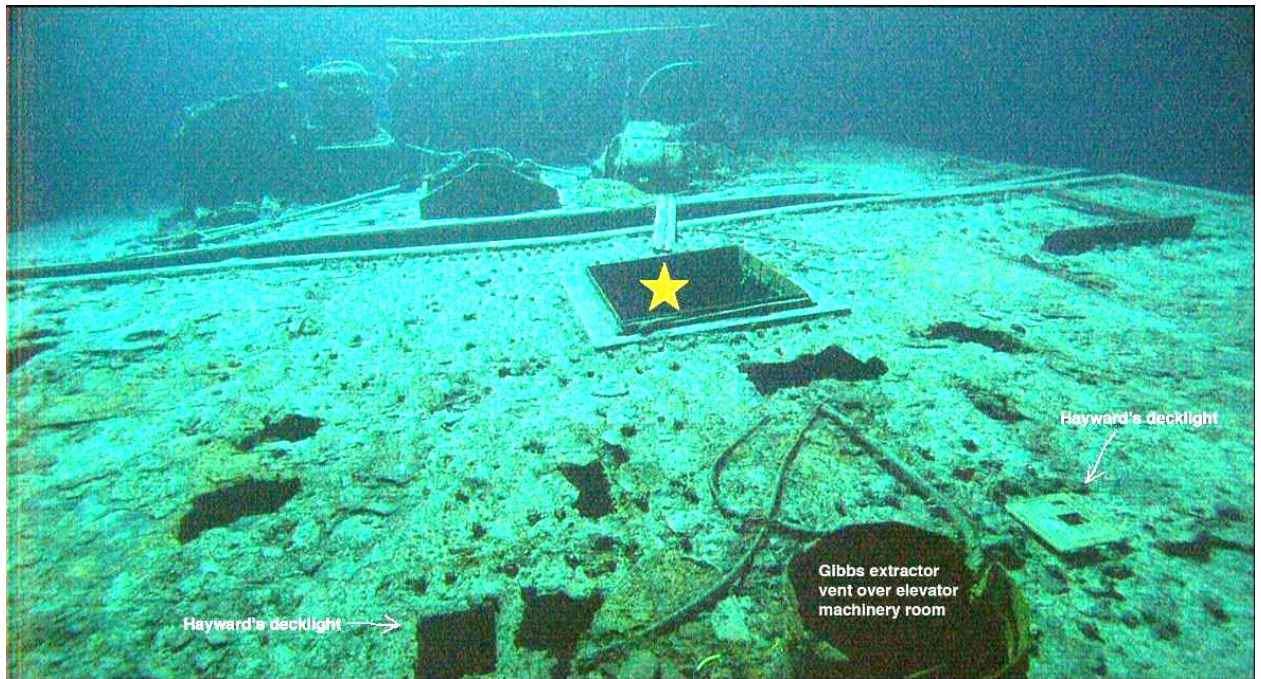


Figure 6. Deck above the Marconi Suite, showing the skylight opening (marked with star), looking forward.

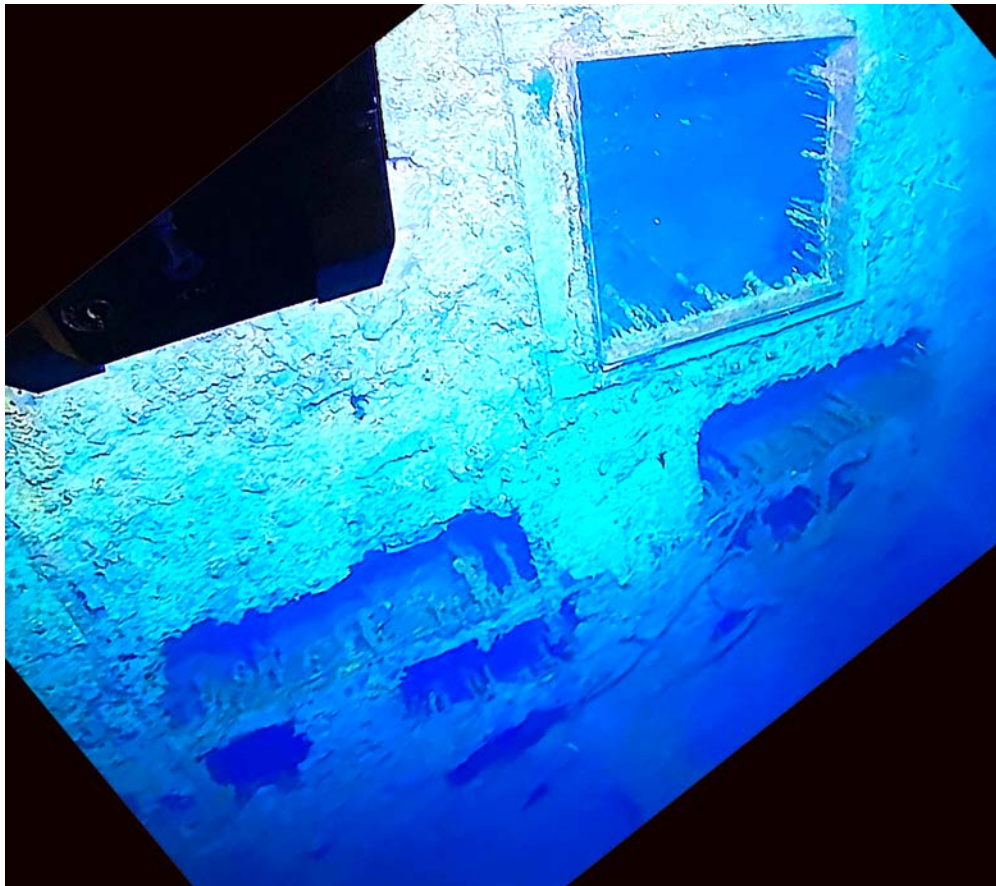


Figure 7. Image of same area from 2019.



Research Design: RMS Titanic Expedition 2020 – 24 MAR 2020**DETAILED DESCRIPTION AND LOCATION OF MARCONI SUITE**

The Marconi Suite consists of three compartments of the following sizes (from port to starboard):

	<u>Length (fore-aft)</u>	<u>Width (pt-stbd)</u>
Silent Room	9.58 feet (2.92 m)	8.14 feet (2.48 m)
Marconi Room	“	7.97 feet (2.43 m)
Sleeping Room	“	6.20 feet (1.89 m)

All compartments have a nominal (as-built) overhead of 7'9”.

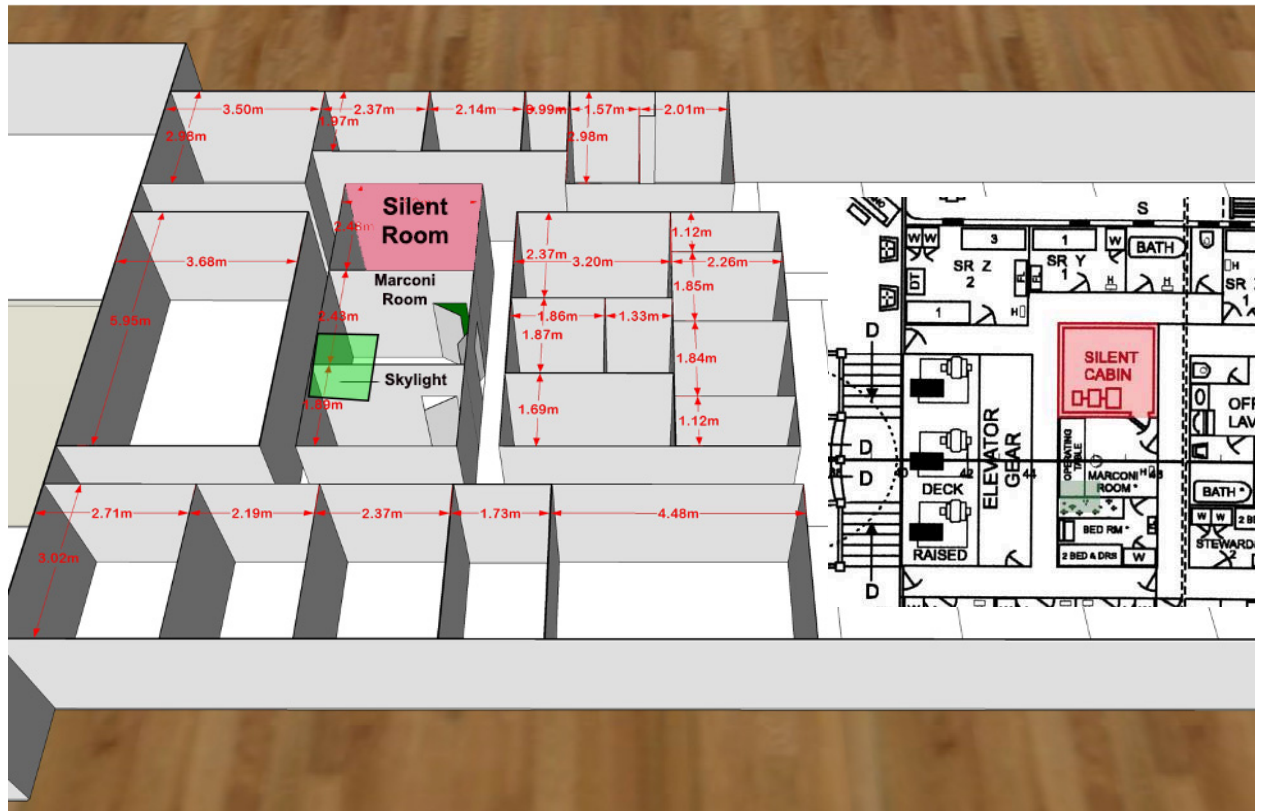


Figure 8. Isometric view of the Marconi Suite, showing skylight opening

**The Silent Room**

The two primary objects for recovery from the Silent Room are both on the former inboard wall (Figures 9 and 10).

- Wall-mounted switchboards and regulators (2 of each)
- Motor-generator set with disc discharger



Figure 9. Graphic reconstruction of the Silent Room.



Figure 10. Graphic reconstruction of the switchboard/regulators (above) and M-G sets (below).

**Wall-mounted switchboards and regulators (2 of each):** These were the main electrical control boards for the power generation of the radio set. Last seen about 2005, they were still attached to the remains of the wood. Today, they may be detached from the wall (but still tethered by their small-diameter electrical cords).

**Motor-generator set with disc discharger:** As the name suggests, this is a DC Motor driving an alternator (for telegraph use) and a disk discharger through a common shaft and mounted on a common bedplate. It is affixed to the steel deck by four ordinary bolts. There is a secondary electrical connection by two bus bars leading aft.

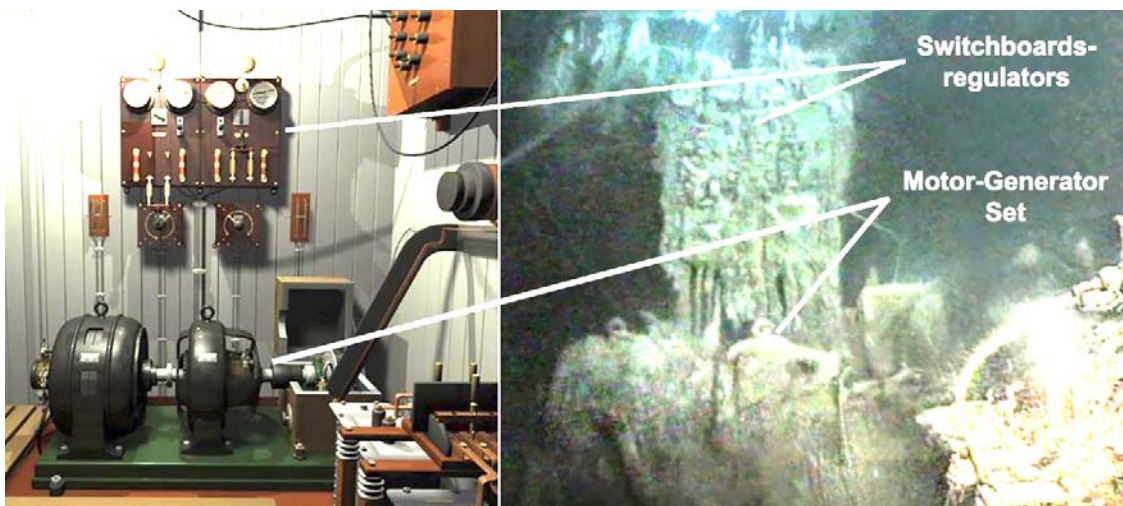


Figure 11. Graphic reproduction (left) and image recorded 2001.



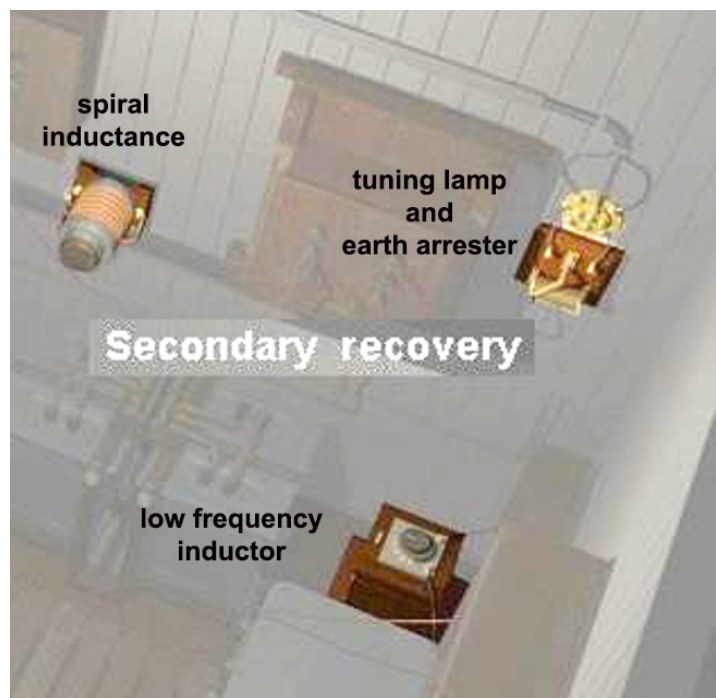


**Figure 12. Motor Generator Set: graphical reconstruction and image.**

The Motor Generator Set is a secondary target and it will not be recovered if doing so would cause too much damage to the ceiling above and floor below. An on-site assessment will be made before any recovery is attempted.

### **Additional artifacts of interest**

These three secondary Marconi components in the Silent Room may be easy to recover, being of modest size and with weak connections to the interior structure. In fact, all three may be completely free, due to deterioration of the inner structural elements.



**Figure 13. Secondary artifacts for possible recovery.**

The secondary artifacts of interest are:

**Spiral Inductance:** This is located on the after wall and consists of a copper coil wrapped into a drum-shape. It is apparently only connected to its surroundings by light gauge wire.

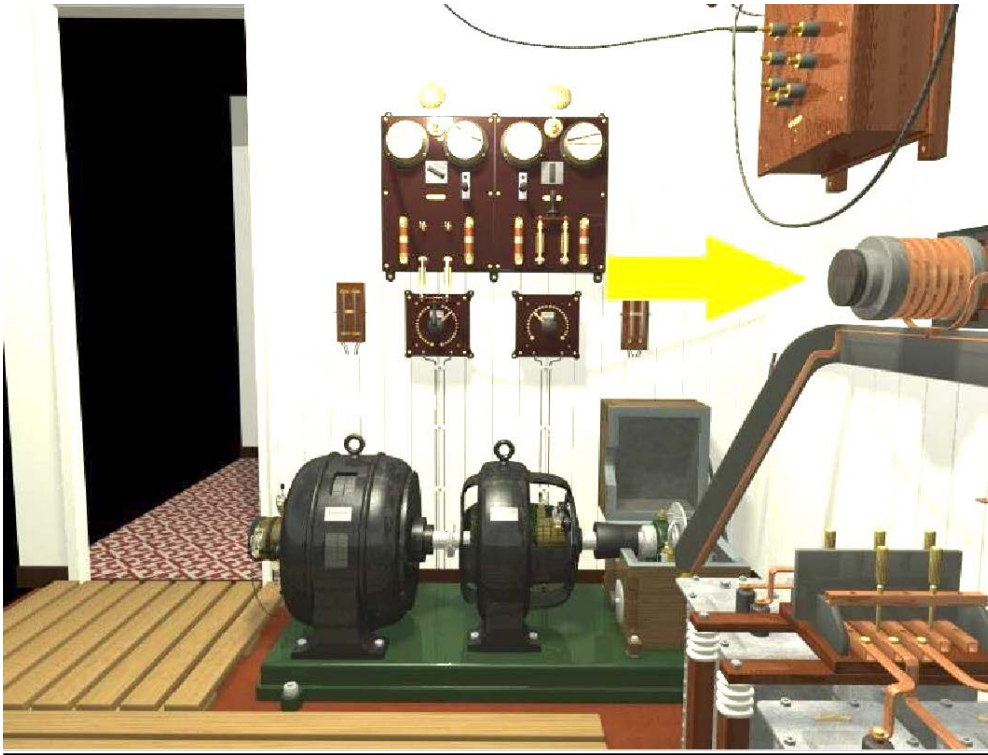


Figure 14. Spiral Figure 13. Inductance coil (yellow arrow).



Figure 15. Additional views of spiral Inductance coil (yellow arrow).



**Tuning Lamp and Earth Arrester:** In essence, this is a lighting arrester. It consists of a stepped brass disk with 8 terminals.



Figure 16. Tuning Lamp.



Figure 17. Low-Frequency Inductor.

**Low Frequency Inductor:** An adjustable coil designed to off-set the high-frequency capacitors.

### HAZARDOUS ARTIFACTS NOT TO BE RECOVERED FROM SILENT ROOM

The objects tinted in RED (Figure 18)—mostly along the forward and outboard walls—were constructed to contain large amounts of oil. They should not be disturbed due to the possibility that they may leak oil, creating a source of potential pollution.



Figure 18. Objects in RED should be avoided, due to hazardous substances.



**The Marconi Room**

The central room in the Marconi Suite, is where *Titanic*'s two telegraph operators sent and received wireless messages and passed them, by way of vacuum tubes, to the Enquiry Room. The skylight is located overhead, between the Marconi room and the adjacent sleeping room (Figure 19).

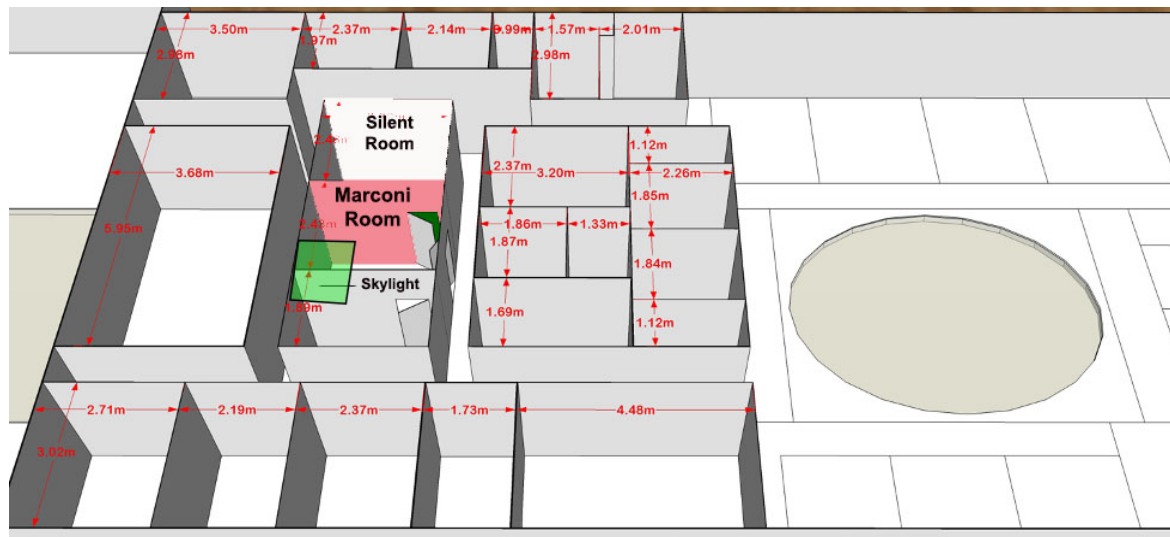


Figure 19. Isometric view showing the Marconi Room and skylight (bow to right).

Because the skylight lies partially over the Marconi Room, it may provide sufficient access to permit recovery of objects within this room with no need to remove deck plating. While objects in the Silent Room were essential to wireless operation, it is the objects in the Marconi Room that were handled by the operators on a continual basis.

Among the objects being considered for recovery from the Marconi Room are (Figure 19):

3. Pneumatic wall clock—this clock was automatically updated to indicate ship's time, which decreased as *Titanic* steamed West;
10. Spark coil and adjuster—this unit allowed the operator to adjust the distance between two brass spheres in order to set the spark gap;
11. Hollow brass cylinders were used to send received messages to be quickly sent to the Enquiry Room by means of brass vacuum tubes.
12. A telegraph “key” was the device used to send messages in Morse Code, a series of short and long tones.
13. A framed wall chart showing the Marconi designation codes for major ships at sea.

Other pieces of equipment may also be encountered in this room, probably among silt and debris on the deck.

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Figure 20. A reconstruction of the Marconi Room (left) and Silent Room. Numbered objects are on the list of possible artifacts to recover.

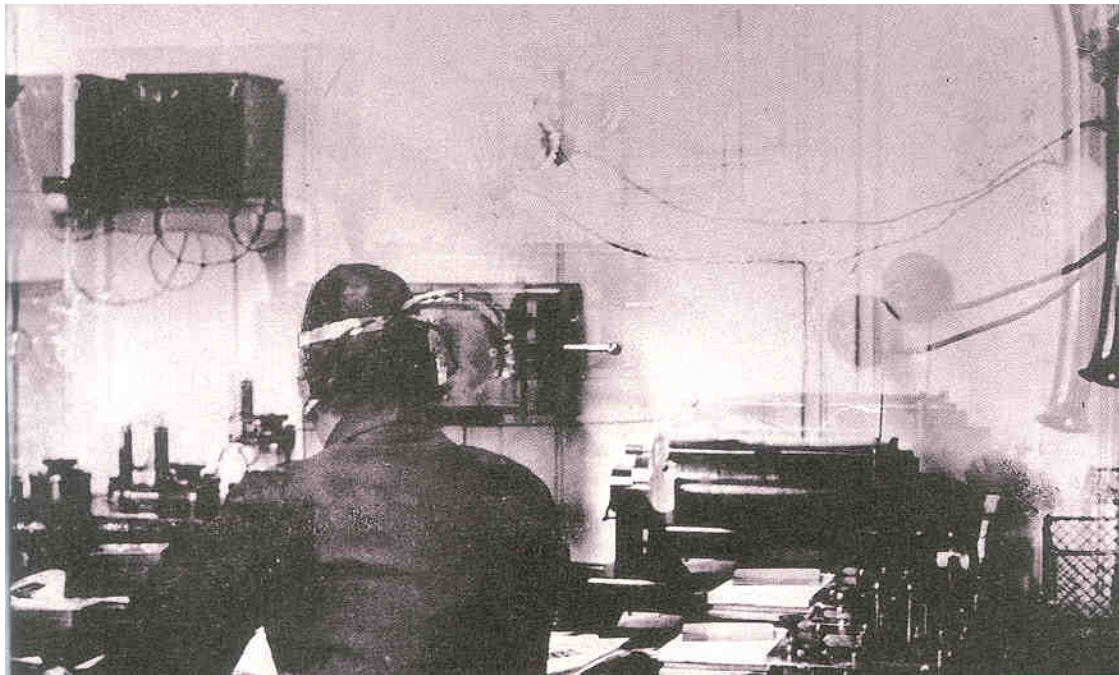


Figure 21. The only known photo of *Titanic's* Marconi Room.

**GENERAL RECOVERY STRATEGY FOR MARCONI SUITE**

If artifact recovery is attempted in the Marconi Suite, it will be done with careful attention to conducting only minimally invasive activities. Before any recoveries are attempted, the senior expedition team will carefully study and discuss the video from the initial survey before deciding if any recovery will take place.

**Marconi Room: Operators' Controls and Wireless equipment**

The Marconi Room offers the best opportunity to recover artifacts from the Marconi telegraph using minimally invasive techniques. It may be possible to recover artifacts by reaching down with the ROV's manipulator arms into the room through the skylight opening, which straddles the ceilings of the Marconi Room and Sleeping Room. A small ROV-operated suction dredge may be needed to remove loose silt from the deck.

**Silent Room: Switchboards and Regulators**

If the wooden wall that formerly held these items has collapsed, they may be hanging by their electrical cords. If so, the ROV may be able to reach down from the overhead deck, grasp the wires, cut them free, and raise the artifacts to the deck where they can be placed into a basket for recovery. Hopefully, this recovery can be carried out through the skylight opening.

**Silent Room: Motor-Generator Set**

Access to this object is the same as above. This component is heavy, and probably still bolted to the deck. Therefore, it may not be possible to free and lift it. This decision will be made at the site following the video survey and the attempt to recover the switchboards and regulators.

**Silent Room: Secondary Artifacts**

Because the primary objects in the Silent Room present serious challenges to recovery, three secondary targets will be considered. Their modest size and light-weight connections to the remaining structures make them attractive alternatives to recovery. A determination will be made on site, based on results from the video survey.

**MARCONI SUITE RECOVERY PLAN (OPTIONAL)**

- **Review Work Parameters**
  - Determine if workable weather limits are predicted for at least a three-day period
  - Determine if ocean currents are within workable limits for operating both ROVs simultaneously
  - Verify that all necessary equipment and accessory tools are in good operating condition
- **Review Video from Initial Survey**
  - Examine the deck area directly above the Marconi Suite and determine if the perimeter around the skylight opening is clear for ROV operations.

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- Carefully examine video from inside the Marconi Room
  - Determine if the skylight opening is sufficient to permit recovery of artifacts through that opening
  - Attempt to identify specific components of the Marconi telegraph system
  - Assess the amount of debris and silt present to determine if any material must be moved or removed in order to located and recover artifacts
- The senior expedition team should review all information and determine if recovery is feasible by using minimally invasive techniques
- Recovery Operations in the Marconi Room
  - Note: The initial video survey should have determined if the Marconi Room can be adequately accessed from the skylight. If so, and if the senior expedition team is in agreement to proceed with artifact recovery, then the next steps will be followed.
  - Deploy recovery basket to primary recovery area
  - Fit the skids of the primary ROV (to be utilized in recovery) with thick pads.
  - Deploy both ROVs to primary recovery area
  - Position one ROV on deck above the Marconi Room, at the edge of the skylight, facing into the opening above the Marconi Room
  - If necessary, employ an ROV-mounted suction dredge in Marconi Room to clear sufficient silt overburden to assess the contents of the room.
  - If artifacts of interest are encountered, gently probe each one to determine if it is loose and stable enough for recovery.
  - Senior expedition team must agree on which objects to recover
  - Recover each agreed-upon artifact and place in a padded, covered basket for transport to surface ship.
  - If the Marconi Room cannot be adequately accessed via the skylight, then the senior expedition team must decide if it is feasible to recover artifacts from the Marconi Room without excessive physical impact to the hull.
- Recovery Operations in the Silent Room
  - After careful review of the initial video survey, following the procedure outlined above for the Marconi Room, the senior expedition team must decide if it is feasible to recover artifacts from the Silent Room without excessive physical impact to the hull.
  - Recoveries from the Silent Room should only be attempted if it can be accessed through the skylight opening or through existing holes in the overhead deck. If recovery would require removal of intact decking, it should not be attempted.
  - If recovery proves to be feasible, artifacts will be recovered in the same manner as in the Marconi Room.



## **Appendix D: Conservation and Curation Plan**

RMST's conservation plan complies with industry standards for laboratory facilities, professional staff, and methodology. Information about RMST's Conservation Facilities and Personnel, and Conservation Methodology, are set forth at length in its "*Titanic* Artifact Collections Strategic Plan 2019-2022," and "Collections Management Policy," filed in the U.S. District Court on May 23, 2019 (ECF 550-3 and 550-4). Both documents are incorporated herein by reference.

RMST has developed the "Artifact Collections Strategic Plan 2019-2022" that details the company's plan for acquiring, processing, storing, and exhibiting artifacts it recovers from the *Titanic* wreck site. The primary mission of RMST the preservation and use of the *Titanic* Artifact Collection to educate future generations about the tragic story, and the stewardship of the wreck site. By extension, stewardship includes the development and safeguarding of documentation related to expeditions, scientific analysis, artifact research, and all internally developed intellectual property that contributes to a more complete understanding of all aspects of *Titanic*.

The *Titanic* Artifact Collection is managed by the RMST Department of Collections. It is a stand-alone department which reports directly to the E/MGroup CEO. As an affiliate of Experiential Media Group, LLC, and a subsidiary of PAHL, RMST's Vice President of Collections is in charge of the *Titanic* Collection and retains a place in upper management to provide a voice for the preservation, management, and future of the *Titanic* Collection, as well as ensuring that the Collection is represented in discussions of non-*Titanic* E/M Group projects.

RMST's overall collections goal is the preservation, management, and protection of all artifacts recovered from *Titanic* and in the possession of RMST. Specific goals include abiding by industry standards and the American Association of Museums Best Practices, expanding the *Titanic* Mapping Project, maintaining a comprehensive database, conducting scientific analyses, and conducting ongoing research.

RMST has also developed a closely related document, the "Collections Management Policy." The primary mission of the RMST Collections Department is the preservation and use of the *Titanic* Artifact Collection to educate future generations about the tragic story. By extension, stewardship includes the development and safeguarding of documentation related to expeditions, scientific analysis, artifact research, and all internally developed intellectual property that contributes to a more complete understanding of all aspects of *Titanic*. RMST has sought and will continue to seek to preserve and promote the memory of the *Titanic* with dignity and respect, and with due regard to *Titanic*'s historical and maritime significance.

Note: Information about RMST's Curation of Recovered Cultural Material, and Curation of Digital and Paper Records, are set forth at length in its "*Titanic* Artifact Collections



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Strategic Plan 2019-2022,” and “Collections Management Policy,” filed in the U.S. District Court on May 23, 2019 (ECF 550-3 and 550-4). Both documents are incorporated herein by reference.

**General Methodology**

A materials conservator from Conservation Solutions, Inc. will be a member of the expedition team on board the research vessel. All operations will be conducted in a sensitive manner befitting RMS *Titanic* as a maritime memorial, and to reduce negative impacts to cultural materials and the associated marine environment. Artifacts recovered from the site will receive shipboard documentation and stabilization, and will be properly packaged for transport to the appropriate conservation laboratory. Qualified conservation personnel will supervise these activities. Information about recovered artifacts will be archived in the RMST collections database.

**Selection of Artifacts**

Selection of artifacts for recovery from the site of RMS *Titanic* will be based on (1) uniqueness of the artifact, (2) contribution to the understanding of the ship, passengers, and life on board (3) technical considerations, and (4) requirements of the U.S. District Court for the Eastern District of Virginia, Norfolk Division. Personnel from RMST will be responsible for decisions relating to recovery decisions and requirements of the U.S. District Court. RMST’s Executive Director of Collections in collaboration with other Titanic experts have prepared an annotated list of possible targets which will guide selection of artifacts for recovery. Other artifacts will be recovered on a case-by-case basis. Their selection will be based on uniqueness, significance, and relevance to the RMST’s study of the ship, archaeological importance and contributions to the public exhibition program.

The ROV operation team will participate in decision-making as it relates to the technical feasibility of recovering particular artifacts. The underwater archaeologist and conservator will provide input in technical aspects of recovery as requested by project staff to reduce negative impacts to cultural materials and the associated marine environment. The RMST senior expedition team will be responsible for overseeing recovery efforts at the site.

**Recovery of artifacts**

All artifacts will be documented *in situ* before recovery is attempted. Selective recovery of artifacts will be accomplished by one of the ROVs in a careful manner designed to minimize damage to the artifacts as well as other nearby cultural materials and environmental features. Artifacts will be placed in a centrally located recovery basket for retrieval. Artifacts will be carefully unloaded from the recovery basket, and immediately placed under the responsibility and care of the RMST collections staff.

**Shipboard Handling, Documentation, Stabilization, and Packaging**

The RMST staff and a conservator from Conservation Solutions, Inc. will be primarily responsible for shipboard handling, documentation (including cataloging), stabilization (including initial rinsing), and packaging of artifacts from the site of *Titanic*.

**The process for shipboard handling, documentation, stabilization, and packaging of artifacts**

- Recovery basket is brought to the surface, as needed.
- Artifacts are not to be handled or opened without direction from the conservator.
- Artifacts will be removed from the recovery basket and properly rinsed under the direction of the conservator.
- No suitcases or other containers will be opened unless specifically directed by the conservator. Objects are to be stabilized and taken back to a conservation laboratory on land, where they can be properly opened, separated, and exposure to air is in a controlled environment with proper tools and conservation assistance.
- After rinsing, Collections will assign and tag objects with accession numbers (i.e., Tyvek tags and waterproof sharpies).
- Accession numbers will immediately be recorded in a logbook by Collections staff along with a basic object description, and measurements.
- Collections staff will take digital condition shots, with either the accession number clearly visible on the tag, or a dry erase board placed in front of the artifact.
- The initial assignment of numbers, photography and surface cleaning will occur in a lockable space on the ship with limited or controlled entry. If no Collections staff are available, the processing space will be locked.
- Under the direction of the conservator, artifacts will be safely placed in bins:
  - Either fresh water or salt water will be available in bins depending upon material type (decisions will be made by the conservator during recovery).
  - Artifacts will be separated into different bins according to material type.
  - Packing materials to safely protect artifacts from abrading each other or against walls of bins will include plank foam, ethafoam sheets, and Terylene foam rolls.
    - The foam plank and sheets will be used to wrap heavier objects, which will weight down the foam.
    - Lighter objects will be wrapped in the Terylene, which will absorb water and sink, protecting objects from abrasions.
    - Waterproof duct tape can be used only on wrapping materials to help hold materials in place (never placed on artifacts).
- As log sheets are completed, they will be processed for data entry into the RMST collections database.

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- From the database, a certificate of origin will be printed and signed for each artifact by the Captain of the ship and the expedition leaders.

**Off-loading and Transportation**

The packaging and transportation of artifacts recovered from the site of RMS Titanic will be completed as follows:

- A truck will be reserved a few days before arrival of the ship at its port of entry.
- Artifacts in bins will be stabilized from movement with the addition of foam if needed, covered with lids, and lids ratcheted down.
- Artifacts in bins will be lifted by crane off ship to dockside.
- A forklift will be needed to load bins into the delivery truck.
- The bins will be shipped to a conservation center on land.

**Conservation and Curation**

Long-term conservation and curation of artifacts recovered from the site of *RMS Titanic* will be completed at appropriate conservation laboratories. These laboratories include temperature and humidity-controlled storage, professional staff, and the capability to process artifacts of diverse media.

Conservation treatment proposals will be reviewed with conservators and management to ensure continuing care and stewardship of the artifacts.

## **Appendix E: List of Artifacts to be Recovered**

Additional artifacts will be recovered from the debris field and within the hull based upon their value as exhibition items and/or because of the likelihood that they will be damaged within the next decade or two if not recovered.

Selection of artifacts for recovery will be based on: (1) uniqueness of the artifact, (2) contribution to the understanding of the ship, passengers, and life on board (3) technical considerations, and (4) any conditions specified by the U.S. District Court for the Eastern District of Virginia, Norfolk Division.

On-site RMST personnel will be responsible for recovery decisions. RMST's Executive Director of Collections in collaboration with other *Titanic* experts are in the process of preparing an annotated list of possible targets for artifact recovery. This list will guide selection of artifacts for recovery. Other artifacts will be recovered on a case-by-case basis. Their selection will be based on uniqueness, significance, and relevance to the RMST's study of the ship, historical and archaeological importance and contributions to the public exhibition program.

The ROV operation team will participate in decision-making as it relates to the technical feasibility of recovering particular artifacts. The underwater archaeologist and conservator will provide input in technical aspects of recovery that will ensure that impacts to cultural materials and the associated marine environment will be minimally intrusive. The expedition senior team will be responsible for overseeing recovery efforts at the site and final selection of artifacts for recovery.

## **Appendix F: Primary Expedition Equipment**

### **Research Vessel**

The expedition will be conducted from an oceangoing research and recovery vessel capable of stationkeeping (dynamic positioning), ROV operations, and deployment and recovery of artifact recovery baskets and other equipment, as required, similar to the vessel shown in Figure F-1.

The vessel will have the following capabilities: a fully equipped bridge with skilled personnel, precise global positioning system (“GPS”), and precision navigation system; a machine shop and crew capable of fabricating tools and making repairs, as required; an electronics shop for maintenance and repair of the ROV, camera systems, and other equipment, as required; facilities and support for the crew and scientific party. The ship will also support the operation of two work-class ROVs.



Figure F-1. Typical research vessel of the type to be employed on the RMST 2020 Expedition.

### **Remotely Operated Vehicles (ROVs)**

The expedition will utilize two work-class ROVs equipped with multiple camera systems. At least one will be fitted with a flexible and modifiable suite of tools for recovery, similar to the vehicle shown in Figure F-2, next page.



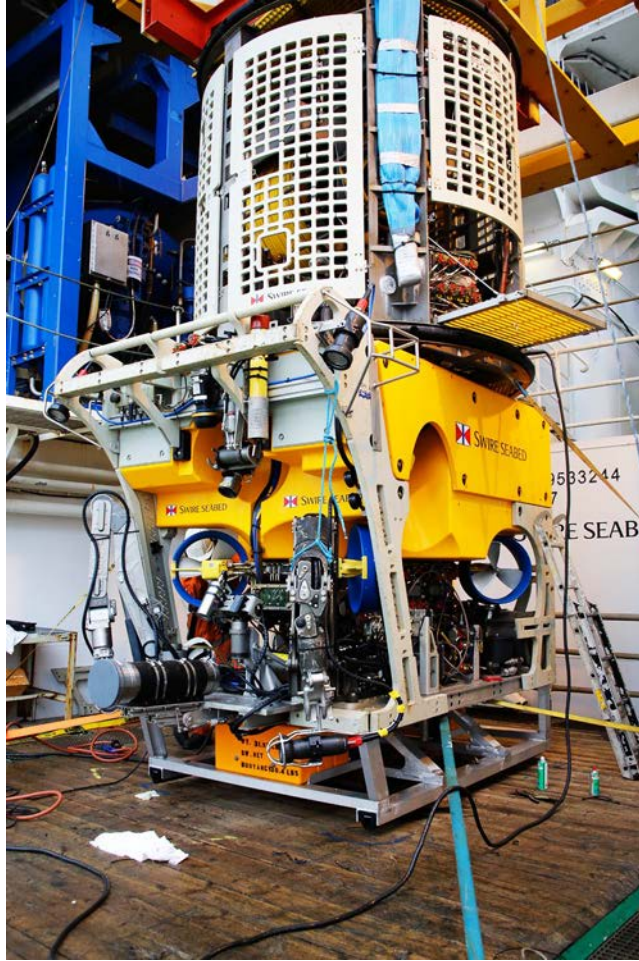


Figure F-2. Typical work-class ROV of the type to be employed on the RMST 2020 Expedition.

### **Specialized Tooling**

RMST is currently developing tooling and equipment with outside contractors to effectively and safely recover the *Titanic*'s Marconi apparatus and related equipment. Due to contractual obligations, this information is proprietary.

## Appendix G: The Story of *Titanic*'s Marconi Wireless Telegraph

Parks Stephenson, *Titanic* Historian

### 1. Introduction

The wreck of *Titanic* is the last surviving witness to the disaster, with stories left to tell to those who are willing to listen. *Titanic*'s Marconi wireless telegraph apparatus literally represents the actual voice of *Titanic* and as such, should be recovered from the wreck as a matter of responsible stewardship of both the *Titanic* wreck site and the ship's legacy.

### 2. Background

The Marconi wireless telegraph transmitting apparatus played a crucial role in the *Titanic* disaster. After *Titanic* left the shores of Ireland on her way across the Atlantic, the wireless transmitter served as the only link between *Titanic* and the outside world. Throughout most of the voyage, ice reports from other ships told *Titanic*'s Captain Smith when the ship could be expected to encounter ice. The reports from the wireless were so meaningful that Smith briefed his officers about the approaching ice they described just 9 hours before the disaster. One popular bit of *Titanic* folklore is that another ship, the SS *Californian*, tried to call *Titanic* up on the wireless about the ice conditions and was rebuffed by a busy operator, but in fact the *Californian*'s operator failed to use proper telegraph protocol, signaling instead in an informal manner that usually preceded boredom-relieving chitchat. Even if the *Californian* message had been delivered, it would not have added to the information that Captain Smith had already received and briefed to his watch officers earlier in the day.

The night before the collision, the Marconi transmitter inexplicitly broke down. The two Marconi Company operators who were assigned to *Titanic* attempted on their own initiative to diagnose the fault and repair it on their own, in violation of their Company's regulations that instructed them to leave such repair for Marconi engineers ashore. After several hours of trial and error, they found and fixed the fault in the electrical windings of the high-power transformer. The transmitter was restored to its full range of approximately 250 nautical miles (NM) or greater, instead of the much-reduced 70 NM range of the emergency backup. Had the operators not taken matters into their own hands, *Titanic*'s Marconi transmitter might not have had the range the following night to reach her eventual rescuer, SS *Carpathia*.

But the most profound impact that *Titanic*'s Marconi transmitter made on the history of the disaster came after the collision. One of Captain Smith's first actions after learning that his ship was doomed was to go personally to the Marconi Wireless Room and instruct the operators to call for immediate assistance from anyone within range of her signals. The distress call was unmistakable, as *Titanic* was the only ship afloat with the newly-developed rotary spark converter, a technological advancement that gave *Titanic*'s spark a character unlike any other. Other ships carried plain-spark dischargers that consisted of two stationary electrodes separated a short distance across from one another, creating an air

gap across which high-power electricity jumped, interrupted by the operator's transmitting key into the long and short static bursts (Morse code) that radiated into the atmosphere to form intelligible words to those who could receive and understand it. The rotary disc discharger, on the other hand, spun 16 electrodes on a flat disc between two arcing electrodes, giving the interrupted discharge a high-frequency musical note, much as we associate with telegraphs today. So, while the other ships were speaking in "whispers" created by the brute discharge of a high-power spark, *Titanic's* telegraphic voice floated high above the others in an unmistakable tone. And that tone was heard first calling for help, later delivering *Titanic's* last words.

Throughout that night, the calls from *Titanic's* Marconi apparatus were heard by ships far and wide. *Titanic's* own sister ship, RMS *Olympic*, heard the call and offered to help, even though she was too far away to be of practical assistance. Of the ships that responded, only *Carpathia* was close enough to reach *Titanic* within a reasonable amount of time. All that the other ships could do was to record in their telegraph logs the wireless operator's description of events as they unfolded aboard the doomed liner. The last signals were recorded by SS *Virginian*, who heard two ragged test signals from *Titanic* before the signals halted abruptly for good. Before 2001, that was all that could be known about the last actions of *Titanic's* two wireless operators as they performed their duty right up to the end.

In 2001, James Cameron explored the interior of the wreck's bow section. His interior survey formed the basis of an archaeological baseline for key surviving areas inside the wreck. One such area was the remains of the "Silent Cabin" – the name given to the room in which the Marconi transmitting apparatus was housed – inside the Officers' Quarters deckhouse on Boat Deck. The sound-proofed walls of that room evidently withstood the hydrodynamic forces that scoured all surrounding spaces, preserving and protecting the complete spark transmitting apparatus within. Over the years, bacteria consumed most of those walls, revealing that apparatus in its entirety to Cameron's ROV cameras. Amazingly intact, the transmitting switchboards and regulators told the complete story of the operators' final actions to keep the signals transmitting, even as the ship's supplied power became weaker and more unstable. The operator's settings on those components – frozen in time – showed that they understood that their signal was becoming ragged and attempted to tune the set one final time before the power completely failed, thus making sense of the test signals and abrupt signal loss recorded by *Virginian*. Not only did the survey of the Silent Cabin reveal information about the apparatus that no other source could provide, it also gave life to some of the previously-unknown last moments of the heroic crew aboard *Titanic*.

### **3. Argument**

Previous to Cameron's 2001 survey, little was known of what is arguably the most famous radio in history. Each maritime wireless telegraph installation was tailored by the local Marconi engineer to its host ship, so even the Marconi Company archives had no *Titanic*-specific information in its possession. A single photograph exists of *Titanic's* Marconi operators' room, but not one exists of the adjacent Silent Cabin. Parks Stephenson had to

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basically reconstruct from period documentation a virtual model of the complete transmitting set at the component level, and then manipulate the details and layout of *Titanic*'s unique installation with what could be discerned forensically from the *in situ* wreck imagery. In so doing, he followed as closely as possible professional archaeology rules in order to preserve the information yielded by the wreck. His initial draft 3D model, constructed from the 2001 imagery, was further refined and validated by a second survey conducted by Cameron in 2005. This 3D model serves as the best available archaeological baseline available of this one-of-a-kind artefact.

Stephenson himself dove on the wreck during the 2005 expedition and took special note of how thin the metal deckhouse roof over the Silent Cabin had become, exposed as it has been for over a century to powerful deep-ocean currents. He revisited the wreck as a field producer for the History Channel during the 2010 survey expedition led by RMST and again as a dive observer in 2019. Over the years, he has documented the deterioration of the deckhouse overhead, under which the remains of the Marconi wireless transmitter sits. Large sections of that overhead have collapsed since 2005, taking with it some outlying surviving elements of the Marconi system, including a Magneta clock relay box in a nearby athwartships passageway and the Marconigram pneumatic motor in the Elevator Machinery Room. In 2019, Stephenson noted the first holes opening up over the Silent Cabin, in the immediate vicinity of the surviving wall upon which are mounted the intact switchboards and regulators that provided ship's power to the transmitter. In the next few years, the overhead for the Silent Cabin is expected to collapse, potentially burying forever the remains of the world's most famous radio.

The world's sole surviving 5kW Marconi marine wireless telegraph set could be saved from being lost in the eventual deterioration of the wreck. In an archaeological sense, it has already been documented in the best possible *in situ* state, a normal requirement before any extraction can be considered. It can be argued that the historical and emotional value of this artefact is greater than the aesthetic appearance of the deteriorating deckhouse in which it is currently housed. The physical condition of that deckhouse is rapidly approaching the point where it can no longer protect this artefact and will in fact help to bury it in rubble until Boat Deck itself caves in, carrying the Marconi apparatus deeper into the remains of the wreck, where it could lay unseen forever.

This situation forces the question: how long should we wait for retrieval from the wreck when historically-significant artefacts are at risk of being lost forever? Can the world's most famous radio be an example deserving of a change to the company's previous recovery protocol?